the OIL AND GAS JOURNAL

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Type G-SD is the *"economy champion"* among verticals. It's a "high-speed" job, if you consider its ease of installation and adaptability. Actually, however, it's a *medium*-speed unit—giving long life and low operating costs. Send for G-SD bulletin.

OKLAHOMA CITY FIELD—Carl Oil Company uses a 40-H. P. Typ G-SD pumping engine on the Wepaco No. 2 well.

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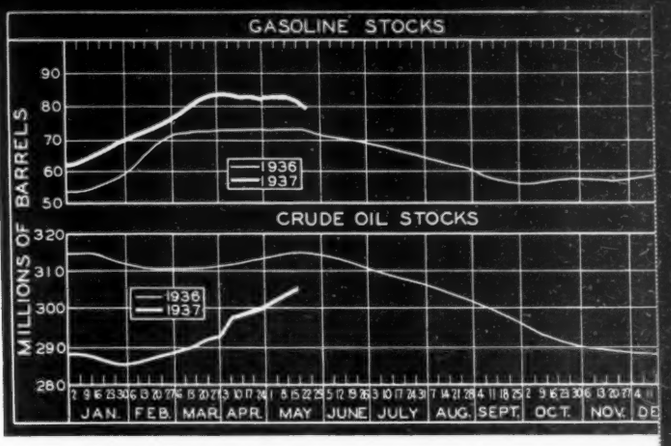


Hope Seen for Cut in Production

WHETHER the monotonous succession of new peaks in crude production is to continue indefinitely should be revealed soon. Action taken in the past week by proration authorities in leading oil-producing states indicates an intention to cooperate in the task of bringing output into line with needs. The Bureau of Mines estimates of June requirements were adopted as the state allowables in Oklahoma and Kansas. In Louisiana the State Conservation Department set the daily allowable at 254,650 barrels, highest in the state's history and a jump of 13,750 above May, but only 2,650 barrels higher than the 252,000 recommended by the bureau. In California too the daily quota fixed for June by the Central Committee of California Oil Producers was 603,900 barrels, just 18,000 more than the bureau recommendation. The Texas Railroad Commission already had set the daily allowable for June 1 in that state at 1,351,198 barrels, a drop of 58,833 from its May 1 allowable and 2,802 barrels below the bureau's recommendation. With active drilling campaigns under way in several areas and with some operators blind to all interests save their own, it remains to be seen whether production actually will be held to the figures named by the state regulatory bodies.

CRUDE PRODUCTION *1,436,864 barrels daily average—up 33,571 barrels.*

CRUDE STOCKS *305,365,000 barrels as of May 15—up 1,217,000 barrels.*

GASOLINE STOCKS *79,827,000 barrels as of May 22—down 551,000 barrels.*

REFINERY RUNS *3,290,000 barrels daily average May 29—up 155,000 barrels.*

Oklahoma, Kansas, Texas, Louisiana and New Mexico, all helped to make the country's daily average production for the week ending May 29 a new all-time record. In Oklahoma the Fitts pool accounted for most of the gain. In Texas minor increases in the various fields carried the total 8,467 barrels higher than that of the preceding week. Louisiana's daily average of 248,302 barrels was 5,872 above that of the week before, but it was 1,098 under the Bureau of Mines recommendation. The daily average of 202,675 barrels in Kansas was a new high for that state.

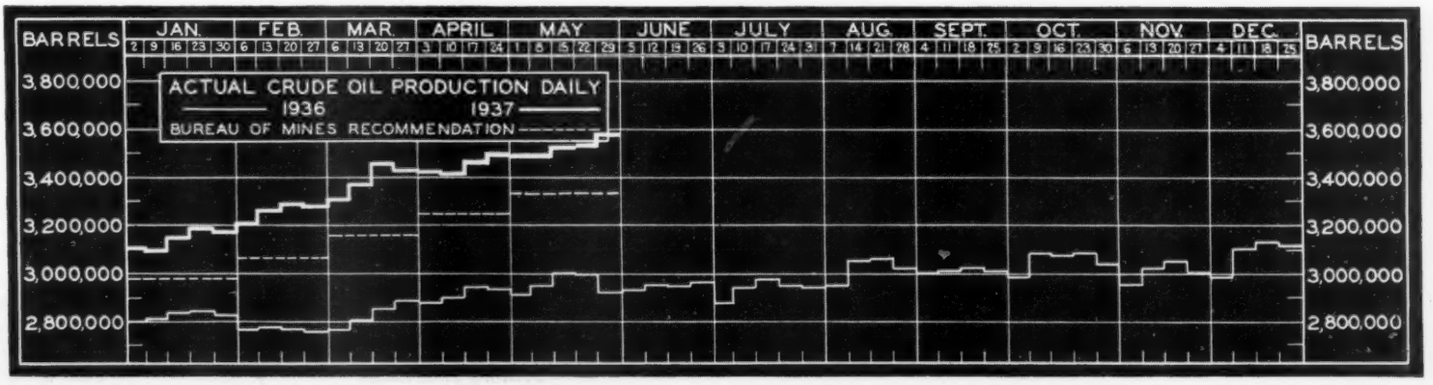
Since the nation's crude stocks began their steady rise at the end of last January some 21,500,000 barrels has been added to storage. More than half of this has been contributed by Mid-Continent fields other than East Texas, where stocks have been diminishing. Notwithstanding the recent 8-cent advance in the price of East Texas crude, reports indicate premiums still are being paid for connections in that field.

Completion of two large producers in the Billings pool, Noble County, Oklahoma, and beginning of a second deep test on the Centrahoma structure in Coal County were among features in the producing division. A producer in Barton County, Kansas, opened a large area for development.

Daily Average Production for Week

	May 29, 1937	Bur. Mines May est.	May state allowables	May 22, 1937
Oklahoma City	165,275	.....	.....	169,525
Fitts	101,775	.....	.....	89,225
Remainder of State	393,725	.....	.....	390,975
Total Oklahoma	660,775	622,700	622,700	649,725
East Texas	467,653	.....	.....	464,957
West Texas	209,837	.....	.....	208,546
Texas Panhandle	85,337	.....	.....	84,948
East Central Texas	124,029	.....	.....	122,849
North Central Texas	106,896	.....	.....	106,699
Gulf Coast—Texas	337,434	.....	.....	335,248
Southwest Texas	105,678	.....	.....	105,150
Total Texas	1,436,864	1,340,800	1,448,700	1,428,397
North Louisiana	78,735	.....	.....	76,130
Gulf Coast—Louisiana	169,567	.....	.....	166,300
Total Louisiana	248,302	249,400	240,900	242,430
California	658,500	583,300	603,900	659,000
Kansas	202,675	187,100	187,100	197,550
Arkansas	27,150	28,500	.....	27,120
Eastern Fields	118,300	117,400	.....	116,700
Michigan	45,500	34,900	.....	44,243
New Mexico	114,270	99,800	114,000	113,540
Rocky Mountain area	74,470	69,000	.....	74,530
Total United States	3,586,806	3,332,900	.....	3,553,235

Increase, 33,571 bbls. daily.



Geophysical Crews

Magnetometer surveying has played an important part in the geophysical work in southeastern United States

SHREVEPORT, La., May 31.—A concentrated effort is to be made during the coming months to find commercial oil production in the southern states of Mississippi, Alabama and Florida. Land men of many companies are actively blocking acreage which appears attractive for geophysical exploration, and 14 crews are mapping structures in that area at the present time. Also 15 wells are active in Mississippi, 4 in Alabama and 6 in Florida.

There are two distinguishing differences between this present campaign and those of several years past in these states. First, in order to justify the expensive exploration planned, very large blocks are being taken, the most extensive of which is in Florida and comprises about 1,000,000 acres. Second, the most advanced type of geophysical work is to precede drilling here. The first entrance of a major company with seismograph is soon to be made in Florida, which to any marked extent, is also true in the other two states.

MISSISSIPPI

Generally speaking, the normal structure of the Mississippi beds is that of a gentle monocline dipping westward. The most conspicuous departure from this normal attitude is the Jackson dome in Hinds and Rankin counties. Here the major portion of the gas and the only oil production ever found in Mississippi is produced. In the Jackson oil and gas field, gas is produced from the Midway formation (basal Eocene) at approximately 2,400 feet. To date about 65 gas wells have been completed, the three most recent gauging about 40,000,000 feet initially, with 470 pounds rock pressure. Three wells on the flank of this field are producing a heavy asphaltic base oil (13 degrees A.P.I.) from the upper part of the Selma chalk of Upper Cretaceous age.

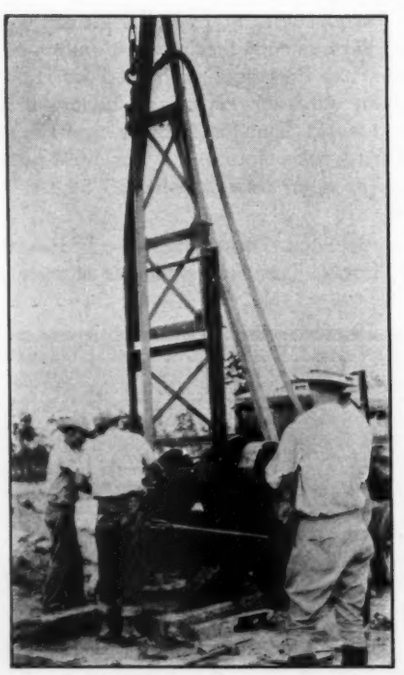
Five wells in Monroe County, near Amory, yield gas from Paleozoic beds, but no oil has yet been found there.

The records of wells drilled thus far show a marked unconformity between the base of the Upper Cretaceous and top of the Paleozoic, as no Lower Cretaceous, Jurassic or Triassic beds have been logged. The Upper Cretaceous consists of four major subdivisions in Mississippi; progressing downward they are the Ripley, the Selma chalk, the Eutaw, and the Tuscaloosa formation at the base. They are of marine origin, with average thickness of about 1,000 feet in the northern part of the state, and much thicker in the southern part.

Mississippi has been the scene of much wildcat drilling in the past. Gulf Refining Co. and United Gas Public Service Co. have probably been the most active majors in this territory. Many deep exploratory holes have been drilled during recent years, the deepest in Covington County, southern Mississippi, by Eastman Gardiver and others to 8,002 feet. United Gas drilled a 7,000-foot well in Green County, southeast Mississippi, and Gulf Refining Co. drilled a 7,000-foot test in Stone County in 1934.

The most recent deep test was made by the state of Mississippi upon its fee land on the eastern flank of the Jackson gas field, Township 6n-1e. Known as No. 2 fee, this well was carried to 5,529 feet before plugging back and completing in the gas horizon. It was reported to have gone out of Lower Cretaceous at about 2,950 feet, and some difference of opinion exists as to the exact age of the formations drilled below this level in the Jackson dome. For the last 2,000 feet all sands encountered were tight and lacking in porosity, and of a nonmarine character, so some have logged them as Lower Trinity. The presence of igneous material with hard sand rock and shale has served to discount this belief.

The most significant development in Mississippi during recent years was the discovery of a salt dome in Lamar County by Sun Oil Co. and others in No. 1 Scanlon and Semnes, section 28-4n-15w, where anhydrite was topped at 1,655 feet, salt at 2,522 feet, and drilling continued to 4,024 feet in salt before abandonment. Sun's second well drilled to define limits of this dome was No. 1 Talley, SE SW SW, same section, abandoned at 2,016 feet in shale and lime, after logging hard lime with pyrites just above. Returns were lost at this depth, but indications were sufficient to justify moving about 900 feet. The third test, No. 2 Talley, NW NE NW section 33-4n-15w, topped anhydrite at 2,975 feet and temporarily abandoned at total depth of 3,034 feet. A pronounced dip was evidenced in No. 2 Talley as subsea anhydrite was drilled at minus 2,573 feet, while in the Scanlon and Semnes well in section 28 it was logged at minus 1,338 feet, or a drop of 1,235 feet in a short distance. Small streaks of asphalt were noticeable through the calcitic caprock in No. 2 Talley. No. 3 Talley is now being drilled to the southeast in section 33-4n-15w, as further exploration of this dome.



Drilling shot holes

The presence of anhydrite and salt has done much to substantiate the belief some have held for several years that such dome structures exist along the Mississippi Coast, and arrangements are being made to conduct a search in the near future.

Most recent geophysical work and blocking in Mississippi is reported as follows:

Bids have been received by Mississippi State Mineral Lease Commission for shooting rights on

Busy in Mississippi, Alabama, Florida

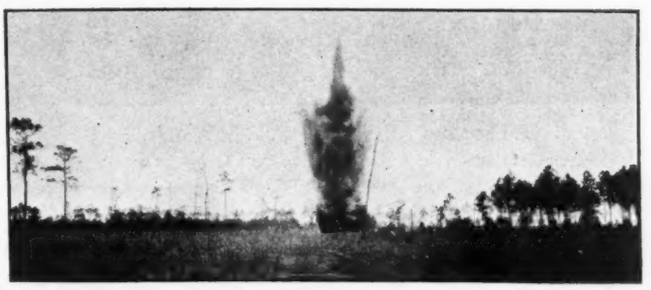
By MITCHELL TUCKER

the Mississippi Sound floor fronting the counties of Hancock, Harrison and Jackson in extreme western portion of the state, extending 18 miles into the Gulf from the shore.

Both the Humble and Sinclair companies have been negotiating for geophysical option on the 350,000 acres of Great Southern Lumber Co. land in the Louisiana parishes of St. Helena, Tangipahoa, Washington and St. Tammany, adjoining Mississippi.

Shell Petroleum has sponsored a gravimeter crew in Wilkinson County, Mississippi, in the Woodville area. In the same area Danciger interests are detailing every 1,000 feet in Townships 4n-1w and 4n-2w. Three wells are expected to be started soon in this extreme southwestern county upon Foster Creek Lumber Co. lands.

Cleve Love, associated with Frank Tatum of Hattiesburg, has assembled a large block in southwestern Green and northwestern George counties, and is making location for a 7,000-foot test or to the Tuscaloosa in section 8-1s-8w. Phillips, Sun and other majors are identified in this block.

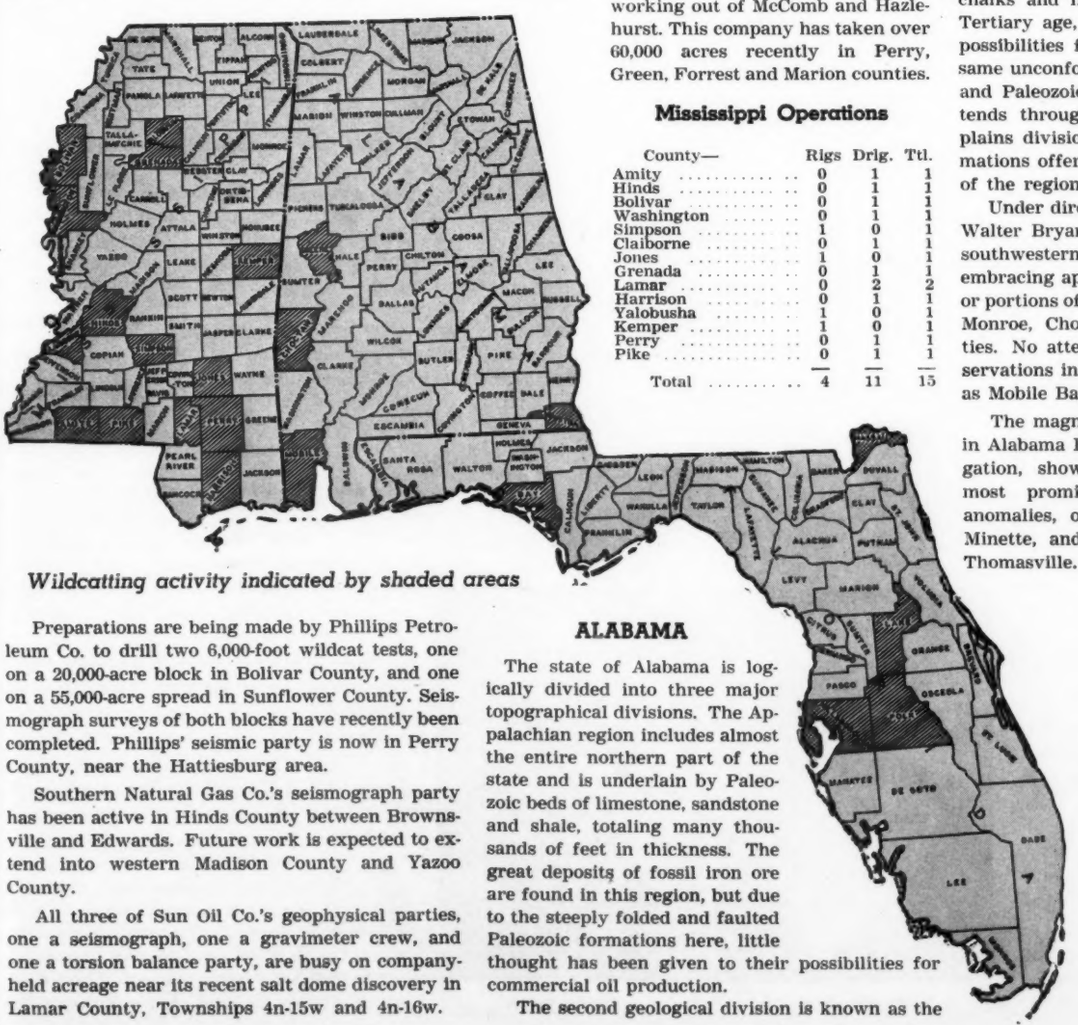


Older type of refraction shot for seismograph work

Continental Oil Co.'s gravimeter outfit is now in Washington Parish, Louisiana, and plans to work into the lower counties of Mississippi, it is reported.

California Co.'s seismograph crew is working in Lincoln County, near Brookhaven.

Gulf Refining Co.'s two gravimeter outfits are working out of McComb and Hazlehurst. This company has taken over 60,000 acres recently in Perry, Green, Forrest and Marion counties.



Wildcatting activity indicated by shaded areas

Mississippi Operations

County—	Rigs	Drlg.	Ttl.
Amity	0	1	1
Hinds	0	1	1
Bolivar	0	1	1
Washington	0	1	1
Simpson	1	0	1
Claiborne	0	1	1
Jones	1	0	1
Grenada	0	1	1
Lamar	0	2	2
Harrison	0	1	1
Yalobusha	1	0	1
Kemper	1	0	1
Perry	0	1	1
Pike	0	1	1
Total	4	11	15

Preparations are being made by Phillips Petroleum Co. to drill two 6,000-foot wildcat tests, one on a 20,000-acre block in Bolivar County, and one on a 55,000-acre spread in Sunflower County. Seismograph surveys of both blocks have recently been completed. Phillips' seismic party is now in Perry County, near the Hattiesburg area.

Southern Natural Gas Co.'s seismograph party has been active in Hinds County between Brownsville and Edwards. Future work is expected to extend into western Madison County and Yazoo County.

All three of Sun Oil Co.'s geophysical parties, one a seismograph, one a gravimeter crew, and one a torsion balance party, are busy on company-held acreage near its recent salt dome discovery in Lamar County, Townships 4n-15w and 4n-16w.

ALABAMA

The state of Alabama is logically divided into three major topographical divisions. The Appalachian region includes almost the entire northern part of the state and is underlain by Paleozoic beds of limestone, sandstone and shale, totaling many thousands of feet in thickness. The great deposits of fossil iron ore are found in this region, but due to the steeply folded and faulted Paleozoic formations here, little thought has been given to their possibilities for commercial oil production.

The second geological division is known as the Piedmont Upland in the east central portion of the state, underlain by very old crystalline beds, such as granites, quartzites, and marbles. This area has never been considered as possible oil producing territory.

The coastal plains division in the southern portion of Alabama is underlain by clays, sands, chalks and limestones of Upper Cretaceous and Tertiary age, and offers the only present known possibilities for oil production in the state. The same unconformity between the Upper Cretaceous and Paleozoic beds that exists in Mississippi extends through the western part of the coastal plains division of Alabama, and these lower formations offer an additional objective to explorers of the region.

Under direction of the Alabama state geologist, Walter Bryan Jones, a magnetic investigation of southwestern Alabama was recently completed, embracing approximately 7,000 square miles in all or portions of Mobile, Baldwin, Escambia, Conecuh, Monroe, Choctaw, Washington and Clark counties. No attempt was made to take magnetic observations in any of the larger water bodies, such as Mobile Bay and Mississippi Sound.

The magnetic map of the region, as published in Alabama Bulletin No. 43 following this investigation, shows several important features. The most prominent are two positive magnetic anomalies, one several miles southeast of Bay Minette, and the second a few miles south of Thomasville. It is not determined at this time whether these plugs represent residual remnants of an eroded basement floor, or actually intruded masses, but both of these positive anomalies have been interpreted as repressuring deep-seated plugs of igneous rock.

Several minor anomalies are seen on the magnetic map in the southern portion of the area. The more important of these are located, first immediately south and southeast of Fairhope, second northwest from Mobile on Dog River, and third southwest from Mobile on Dog River, and fourth west of the town of Uriah in southwest Monroe County. Several deep holes have been drilled during

(Continued on Page 36)

C. W. Froome | C. E. Reistle, Jr. | J. T. Hayward | W. E. Gilbert | G. G. Oberfell

A. P. I. Studies Technical Problems and Practices

By C. O. WILLSON

COLORADO SPRINGS, Colo.—Several hundred representatives of oil companies and manufacturing and supply organizations which serve them, attending the seventh mid-year meeting of the American Petroleum Institute this week, discussed modern practices in the fields, plants and laboratories and gave consideration to some of the broad general problems of the entire industry. These executives and technologists of the oil industry on whose shoulders rests a large part of the responsibility of maintaining its present record operations are constantly being confronted with new problems which reports here showed they are solving.

The 30 papers presented at the technical sessions of the producing and refining divisions dealt with recent developments in operating practices. In addition, more than 50 standing committees and subcommittees reported progress in studies which also have to do with the practical problems of operators. The work of these committees covers a wide range of subjects, including improvements and standardization of equipment and materials, disposal of wastes, accident prevention, methods of testing, uniform oil accounting, and many other operating practices.

Committee reports showed that the enlarged and constantly changing operations of the industry have increased the activities of many of these committees so that their work is never ended. Their studies and investigations, however, have progressed so that they are a constant guide to the industry in carrying on many phases of its operations.

Indicative of the accomplishments of these committees was the report of a special subcommittee on drilling contract forms. The subcommittee reported that it had completed a draft of a contract by which drilling contractors and oil producing companies will be able to effect a much more complete understanding regarding costs in drilling operations. The report will be submitted to the drilling practice committee and the general production committee. If finally adopted, it will be an important contribution in removing many of the hazards in estimating drilling costs and will aid producers and contractors in arriving at agreements satisfactory to both parties.

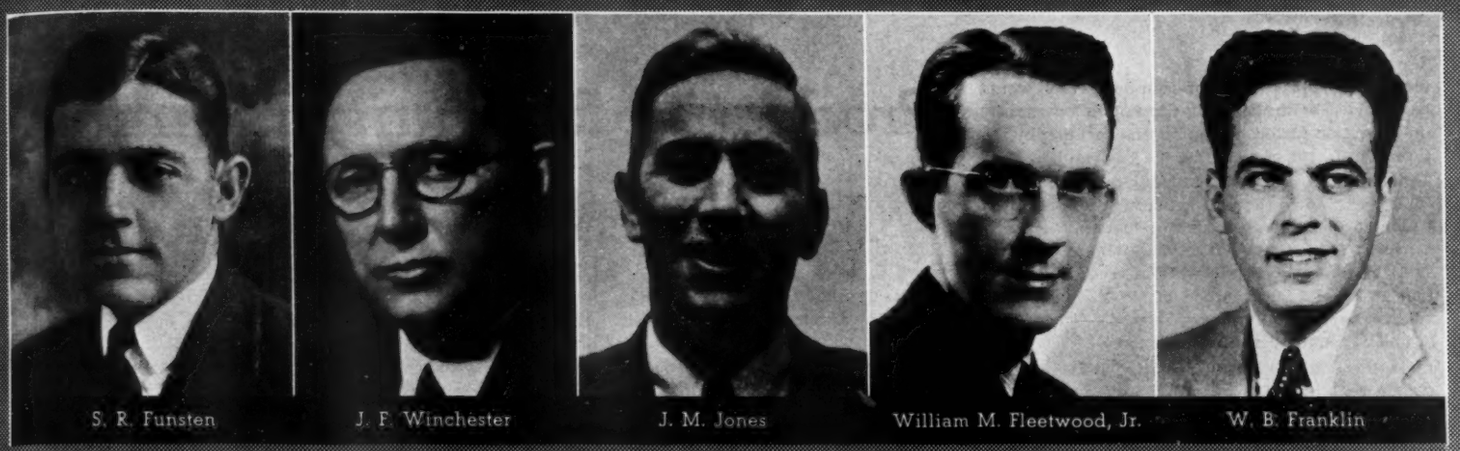
Another recommendation of importance to the manufacturing branches came from the subcommittee on measuring, sampling and testing natural gasoline. The subcommittee recommended that the American Society for Testing Materials adopt the method of taking vapor pressure of natural gasoline as outlined by the Natural Gasoline Association of America. This recommendation is expected to bring about a general adoption of a testing method which has been studied and developed over a period of several years.

R. E. Haylett | E. W. Isom

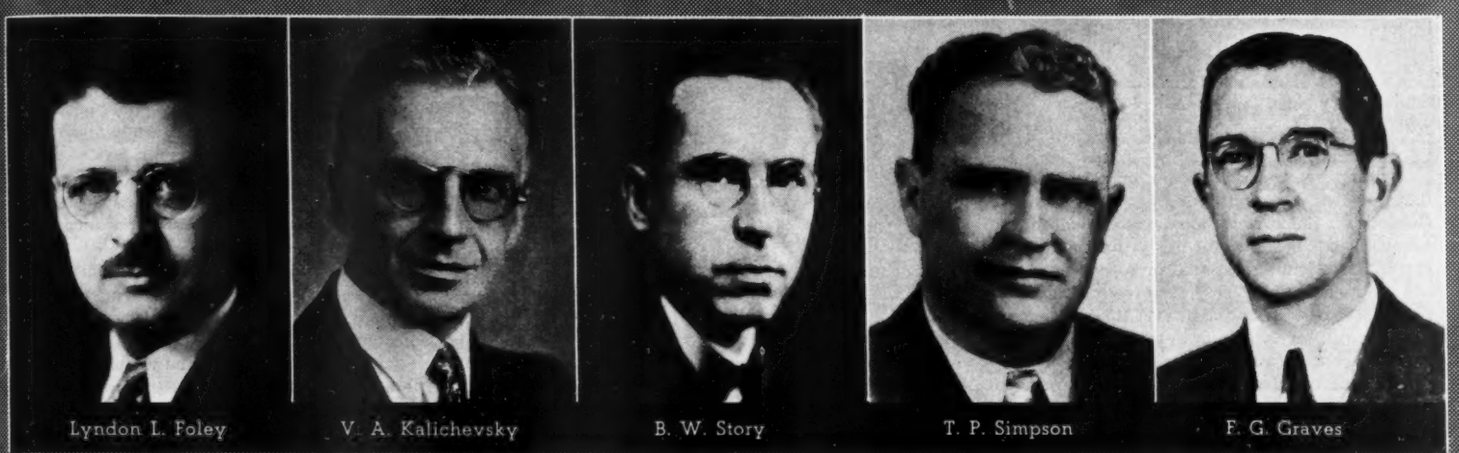
Special interest was attached to those papers and discussions which dealt with estimation of reserves, proration problems and unitization. B. H. Sage and W. N. Lacey, of the California Institute of Technology, outlined their macroscopic methods which are considered an important contribution in accurately estimating gas reserves. They also explained laboratory and field studies of hydrocarbon behavior in their relation to the problem of estimating oil reserves. This investigation is one of 43 research projects originally made possible through the gifts of John D. Rockefeller and Universal Oil Products Co. The importance of these research studies, which in some cases have been under way for several years, has been apparent over the past year to their relationship to some of the immediate problems of the industry.

Photographs of presiding officers on this page. Portraits of authors of papers, following pages

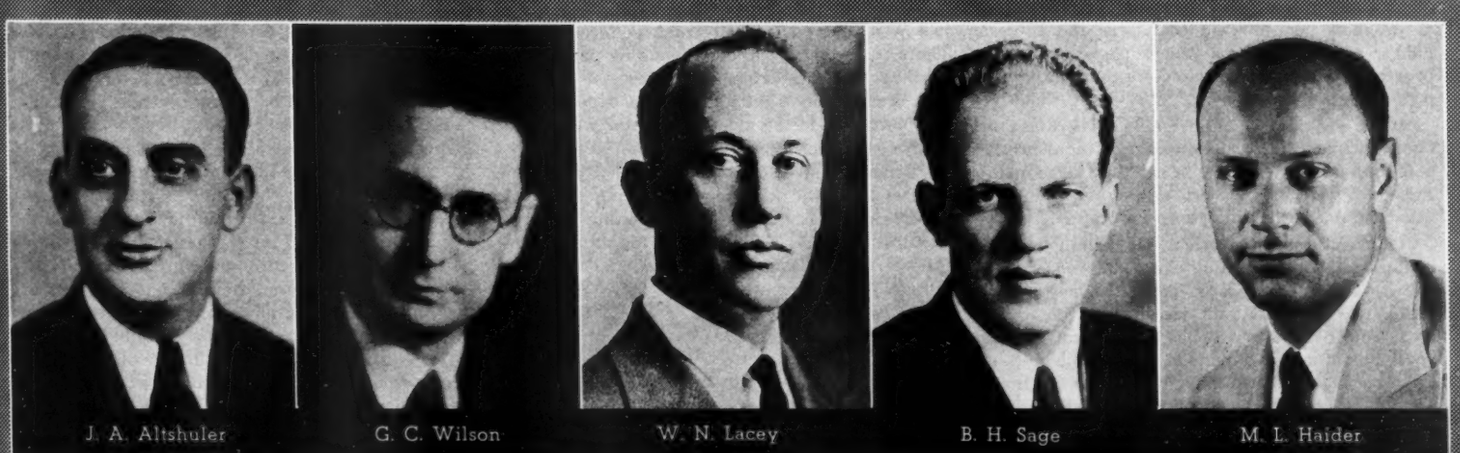
L. L. Foley, of Tulsa, offered a practical solution to the problem of prorating crude output to meet market demands on a basis which would be equitable to the producers concerned. His plan is based on allocations which will give each operator an allowable production proportional to the recoverable oil under his land. This method of allocation, upheld by the courts, has been the objective of several investigations. His plan provides for an index of recoverable oil and a proration factor. The proration factor would be the acreage of the unit multiplied by the index of recoverable oil. These data would supply a formula for determining



S. R. Funsten | J. F. Winchester | J. M. Jones | William M. Fleetwood, Jr. | W. B. Franklin



Lyndon L. Foley | V. A. Kalichevsky | B. W. Story | T. P. Simpson | F. G. Graves



J. A. Altshuler | G. C. Wilson | W. N. Lacey | B. H. Sage | M. L. Haider

I. S. Salnikov | Robert W. Rieniets | A. E. Buell | Walter A. Schulze | G. O. Lockwood

the allowable production of each unit which would be obtained by multiplying the field allowance by the proration factor of the unit and dividing by the proration factor of all units.

I. S. Salnikov and M. L. Haider, of the Carter Oil Co., explained the unitization plan of operation which has been in effect for two years in the South Burbank field, Osage County, Oklahoma. Discussions here developed the wide interest in unitization as an efficient method of field development made possible largely through a greater knowledge of underground operating conditions.

In the South Burbank area, the unitization of 2,720 acres of a 4,000-acre productive area in 1935 has proved satisfactory to operators. The authors explained that the plan had increased recovery, prolonged the life of the pool, and resulted in substantial savings in exploitation and operating costs. In this field natural gas from the wells is returned to the producing horizons after the natural gasoline has been extracted. Regarding this phase of the operation the authors said the return of the gas has reduced the rate of reservoir-pressure decline. They also explained preliminary work which indicates that gas-oil ratio can be controlled by the use of packers.

Drilling practice discussions included the handling of drill pipe and casing and testing drilling fluids in the fields. A session devoted to oil-country tubular goods brought out many practical suggestions. These included special investigations covering the measurement of pipe threads and a progress report on special threads on thread elements. In pumping, developments in pumping slant holes received consideration. Solution of the problem of vibration of oil wells was discussed. An entire session was devoted to accident prevention.

In three group sessions those interested in refining heard several prepared papers and discussions dealing with improvements in processing methods and new operating devices. New treating technique for light oils which improved quality of products and lowered costs was the subject matter of three papers. These papers reflected progress in treating gasoline so that antiknock properties are preserved.

W. B. Franklin, of the Humble Oil & Refining Co., said that refrigerated storage is more profitable than pressure storage in handling large quantities of light ends. The pressure storage, he said, was desirable in handling active storage.

The strong position of solvent refining in the manufacture of lubricating oils of improved quality was shown in prepared papers. A new application for light oils was described in detail by representatives of the Edeleanu Co., Ltd. In this development sulfur dioxide is used as the solvent in extracting from straightrun naphthas the high-octane constituents for blending purposes. The diesel lubricating problem was discussed in one session.

Productive Ingenuity Running Mad Race With Taxation

COLORADO SPRINGS, Colo., May 31.—The action of Texas in following the lead of Oklahoma and Kansas in reducing its allowable production for June to the Bureau of Mines estimated demand was commended here by Axtell J. Byles, president of the American Petroleum Institute which opened its mid-year meeting here today. He pointed to the increasing tax burden as the only seriously disturbing factor confronting the industry.

"During the first quarter of this year, the petroleum industry enjoyed an 11.7 per cent increase in the demand for crude oil and its products," Mr. Byles said. "An average of 14 per cent more motor fuel was sold domestically and as foreign shipments than during the corresponding period of a year ago. Domestic demand increased 12.5 per cent, a rate somewhat higher than expected and due, no doubt, to the moderate winter weather as compared with the previous season.

The Oil and Gas Journal A.P.I. special on the Santa Fe leaving Tulsa

"Crude oil production established a new high level of 3,551,950 bbls. per day during the week ending May 15. It has been running between 3,450,000 and 3,550,000 bbls. daily for the past several weeks, resulting in considerable additions to storage. These inventories were 288,000,000 bbls. on January 1 and about 305,000,000 bbls. on May 8, the latest week for which we have definite information. It is not improbable that these inventories may be shown to have reached 307,000,000 bbls. when the May 22 figures are available.

"In these circumstances it is gratifying to see the state of Texas accept the recommendations of the U. S. Bureau of Mines for June, following the lead of Oklahoma and Kansas in May. This is constructive, but does not solve the production problem resulting from increased drilling activity created by the failure to give due weight to the acreage factor. It is important that operators themselves exercise good judgment in the conduct of their drilling programs and that producers strictly adhere to state allowable.

"Demand for crude oil during the remainder of the year should remain high. If, however, the industry is to continue to enjoy good health, levels of crude oil inventories should be watched. This also applies to motor fuel inventories which were approximately 81,000,000 bbls. at the end of April. The overall inventory position of crude and products for the country as a whole is not now serious, but weakness is evident in certain limited areas. It is felt that where this weakness exists it can be corrected by more moderate seasonal increases in runs to stills.

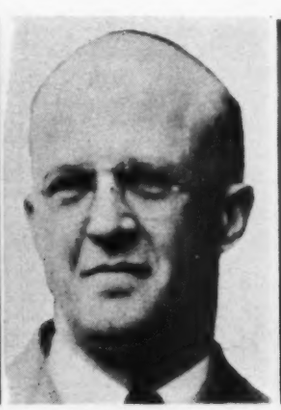
"It is not too soon to give consideration to the effect of excessive gasoline inventories at the close of the summer season when faced with the difficulty of supplying fuel oil requirements without overproducing gasoline during the winter season.

"The only disturbing factor is the unfortunate and steady rise in tax rates and costs, with the petroleum tax bill exceeding $1,000,000 a year and consumers forced to pay such high retail sales taxes as the present 40 per cent levy upon gasoline. In the past decade taxes paid to federal and state governments have averaged approximately eight times the industry's earnings. The tax collector now is the largest single beneficiary of oil company income. In 1936 the tax collector received about one-fifth of all operating revenues, with disbursements for taxes exceeding even wage payments by 20 to 33 per cent.

"Any study of the industry's balance sheet will show that productive ingenuity is running a mad race with taxation, and faring none too well. The obvious need is for a restoration of tax sanity and reasonable tax rates through reduction in the cost of government, federal, state and local. Most of the American people have to depend upon industry for their livelihood, and they would be directly benefited by any change in the tax situation which would permit money once again to flow freely through the channels of trade and to find its way, through industrial buying and the payment of wages, into the family pocketbook."

B. B. Wescott

Herschel G. Smith



C. G. A. Rosen

H. N. Blakeslee

R. B. Roaper

Among the 300 oil men attending the Illinois-Indiana conference were: F. W. Freeborn, Jr., Adams Louisiana Co., Houston, Tex.; C. C. Hogg, vice president, National Petroleum Co., Titusville, Pa.; Paul F. Lewis, division manager, E. I. DuPont de Nemours, Tulsa; R. W. McIlvain, Jr., division manager, Pure Oil Co., Olney, Ill.; Dr. A. B. Bryan, Carter Oil Co., Tulsa; Fred W. Oudt, geophysicist, Shell Petroleum Corp., St. Louis, Mo., and W. C. Kneale, geologist, Texas Co., Matoon, Ill. Four of the geologists on the program were: C. J. Hares, Ohio Oil Co.; Dr. C. A. Malott, Indiana University; Dr. A. H. Bell, head of Oil and Gas Division, Illinois State Geological Survey, and Dr. M. M. Leighton, chief, Illinois State Geological Survey

Illinois Discoveries Attract Oil Men to Robinson

ROBINSON, Ill., May 31.—Interest in the new oil discoveries in Illinois brought a record attendance of over 300 to the fifth annual Petroleum Conference of Illinois and Indiana held in Robinson Saturday.

Dr. A. H. Bell, of Urbana, Ill., head of the oil and gas division of the Illinois State Geological Survey, and the leading authority on the Illinois field discussed "Recent Developments in the Illinois Basin and Their Significance."

"Prospects are now very bright for production and development and there is solid ground for optimism," Doctor Bell stated, pointing out three fields have been discovered in Illinois within the past few months, two near the deepest part of the Illinois Basin as contoured on the Pennsylvania system.

The dollars and cents outlook for the Illinois and Indiana oil industry was covered by the guest speaker, Paul Blazer, of Ashland Refining Co., Ashland, Ky., who tempered a prophecy of increased prosperity with a warning against overdevelopment, in a talk on "Economics of the Oil Industry."

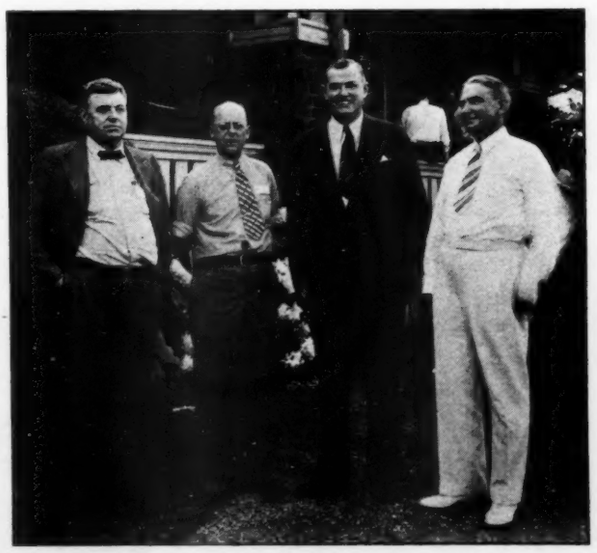
William Bell, of Robinson, Ill., president of the Illinois-Indiana Petroleum Association, and the Illinois member of the Interstate Oil Compact Commission, in his introductory talk also emphasized the need for care against overproduction.

The Illinois Geological Survey Division of the Department of Registration and Education of the State of Illinois, and the Indiana Division of Geology, Department of Conservation, State of Indiana, cooperated with the Illinois-Indiana Petroleum Association in sponsoring the petroleum conference.

Dr. C. A. Malott, geologist, of Indiana University, read a paper on "The Nature of Favorable Oil-Bearing Structures in Pennsylvania Formations in Southeastern Indiana" where extensive seismographic work is now in progress. W. C. Kneale, geologist of Texas Co., now stationed at Matoon, Ill., gave a discussion of the same subject.

Technical features of the seismographic surveys were described by C. M. Boos, geologist, Independent Exploration Co., Houston, Tex., who talked of application in the Illinois Basin.

"The Use of the New Type Gravimeter in Detecting Structures Favorable for Oil" was the subject of a paper by Dr. A. B. Bryan, head of the geophysical division of Carter Oil Co., Tulsa. Fred W. Oudt, geophysicist, Shell Petroleum Corp., St. Louis, Mo., followed with a talk on the same subject, and its particular possibilities in the Illinois field.



HOSTS AND SPEAKER: A. U. McCandless, president, Mahutska Oil Co., Robinson, Ill.; T. B. Steele, secretary of Illinois-Indiana Petroleum Association, Robinson; Paul G. Blazer, president, Ashland Refining Co., Ashland, Ky., and William Bell, Robinson, president of association

W. B. White, Felmont Corp., of Houston, Tex., and F. W. Freeborn, Jr., Adams Louisiana Co., of Houston, joined in a talk on the use of the rotary in the Illinois field, followed by a discussion by J. F. Reglin, Ohio Oil Co., Bridgeport, Ill.

C. C. Hogg, vice president, National Petroleum Co., of Titusville, Pa., spoke on "Repressuring Practices" and their success in Pennsylvania and the possibilities they offer in the old fields in this region of Illinois. He was followed by A. U. McCandless, president, Mahutska Oil Co., of Robinson, who told of the work now being done in repressuring.

Other papers were presented by R. W. McIlvain, Jr., division manager, Pure Oil Co., Olney, Ill., who spoke on "Drilling Problems in the Illinois Basin" using the experience of Pure with its new wells; by C. P. Parsons, vice president of Halliburton Oil Well Cementing Co., Duncan, Okla., on cementing practices; and by Paul F. Lewis, division manager of E. I. DuPont de Nemours & Co., Tulsa, new developments in oil well shooting.

SPARKS FROM THE NEWS

"Shut down because of a duster" in a Kansas scout report does not necessarily mean "dry hole" for the dust storms have frequently made work on the derrick floor impossible.

Oil company executives and technicians have been required to spend so much time in courts that one of the papers presented at Colorado Springs A. P. I. meeting deals with "A Witness' Duties and Rights." Kind of an Emily Post edition for the oil fraternity on etiquette in the court room.

One of the new technical terms for the petroleum engineer is "proration factor" determined by unit acreage multiplied by recoverable oil index. Perfectly simple!

Louisiana's June allowable of 254,650 bbls., an increase of 13,750 over May, is the highest on record. New Iberia was boosted 9,500 bbls. and Lisbon 5,300 bbls. An excess of only 2,650 above the Bureau of Mines recommendation is comparatively modest.

With higher fuel oil prices immediately in prospect buyers are making contracts early this year, recognizing that procrastination may prove expensive.

Daily crude allowables for June set by the leading oil-producing states coincide closely with requirements as estimated by the Bureau of Mines, encouraging hope that an end of excessive production may be at hand.

Export and coastwise orders for natural gasoline came along this year at a season when the market ordinarily is lifeless. Belief grows that no distress stocks will accumulate before buying for fall begins.

Kansas broke all its production records last week with a crude output averaging 202,675 bbls. per day. And this in the week marking the twentieth anniversary of the discovery of Towanda, Kansas' great war-time pool.

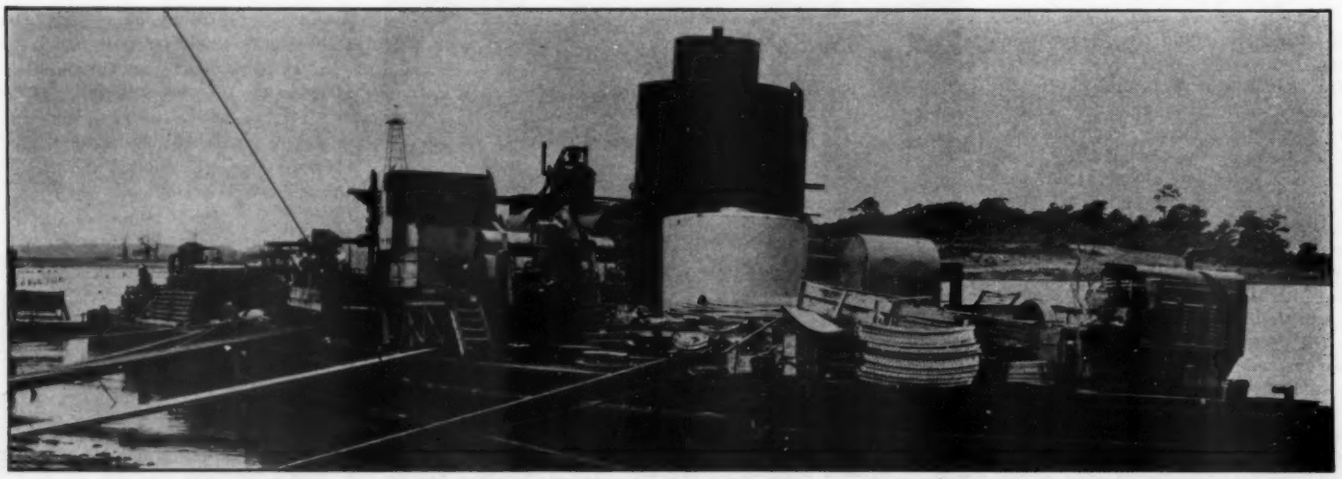
The recent 8-cent increase in posted price for East Texas crude has not stopped premium paying. A good export market and a combination of other favorable market conditions are responsible.

At least one Michigan geologist is quite optimistic in predicting there are 50 new oil fields still to be opened in that state placing in reserve sufficient oil to last 50 years.

Operators in the West Turner Valley field, Canada, are learning they can make big wells out of little ones by proper completion methods.

The heavy sale of oil industry scrap iron will be seriously curtailed if the U. S. observes strict neutrality toward warring nations.

Cutting of tank-wagon and retail gasoline prices is spreading in the Mid-Continent. Some dealer starts it by secretly foregoing most of his profit margin in the hope of increasing his gallonage and perhaps acquiring additional customers. Competitors soon are driven to the same procedure.



MOVING DAY IN THE OIL COUNTRY—Complete drilling outfit, rig, derrick, pipe, boilers and equipment loaded on barges at Goose Creek, to be shipped through Intracoastal canal to a wildcat location in Lafourche Parish, Louisiana

Pumping hot grease into annular space of 8-inch protection pipe at channel crossing. The 6-inch oil line is centered in the 8-inch with slugs

Water Crossings Were Feature of Line From Placedo Field

By F. L. SINGLETON

CORPUS CHRISTI, Tex., May 31. While the construction of any major pipe line along the Gulf Coast frequently necessitates the crossing of numerous inland bays, lakes and rivers, an unusual amount of this particular kind of work has been encountered in laying Barnsdall Pipe Line Co.'s 76-mile electric-welded 6-inch oil line from the Placedo field in Victoria County to tidewater at Corpus Christi.

The contract was let to Williams Brothers Construction Co. and actual work began April 20 at the Corpus Christi end. The line was completed June 1.

In laying this line, which extends from central Victoria County southwesterly through Refugio County, San Patricio County, and part of Nueces County, the contractors were confronted with three major water crossings, five rivers, a 4½-mile crossing at Nueces Bay and the Avery Ship Channel.

There were no unusual problems in laying the "land line" as the right of way was through flat open coastal plains and only five or six drainage canals and small creeks had to be crossed. The contractors were fortunate in having dry weather, as the soil is composed of sticky black gumbo extremely difficult to work in during rainy weather.

Construction of the land line began April 29 and has been progressing at an average rate of 3 miles per working day. Two No. 32 ditching machines were used, along with seven caterpillar tractors, for handling the pipe, and moving welding and paint equipment. The line was laid by the "stove-pipe" method with oxyacetylene welding used. Before the pipe was laid in the ditch, it was cleaned, primed, painted, coated with two coats of hot enamel and wrapped with asbestos felt.

In making the river crossings, it is estimated approximately 15 working days were saved by the use of specially built small barges, designed by the contractors, which could be tied together to form one large barge. After the pipe was laid, all equipment was ferried across and the barges were then parted, loaded on trucks and hauled to the next crossing. Handling of equipment at any river crossing has always been a problem. In most cases these crossings are several miles from bridges and considerable time is lost while the equipment is being moved to the opposite side of the crossing.

The five rivers were encountered between the north side of Nueces Bay and the Placedo field, and included the Aransas, Mission, San Antonio, Guadalupe and Chiltipin. In most cases these rivers were deep and rather narrow and the crossing was made with little difficulty. The pipe was given extra heavy coatings, welded into one full section and pulled across by a tractor or truck on the opposite side.

The most difficult job was the 4-mile crossing of Nueces Bay, and the procedure was an interesting engineering feat. It was necessary to construct seven barges for transporting and laying the pipe. These barges consisted of one large work barge 18 by 40 feet and six smaller barges used in moving the pipe from the loading rack on shore to the work barge, a distance of about 3 miles.

The fleet of barges were towed by a specially designed self-propelled small barge and one to two small motorboats. The self-propelled barge, generally referred to as the "mud-hen," was designed to operate in deep or shallow water, or on land and it proved very useful due to the various conditions under which the work was done. The barge is powered by a Ford motor driving a pair of two reinforced tractor wheels on which were welded a series of steel blades. The wheels, one on each side of the barge, were mounted on a Ford truck rear end.

In moving the pipe from the shore to the work barge, the small barges were tied into pairs lengthwise which proved more desirable than one large barge as they could be handled more easily They also were less expensive to build and could be used on other jobs. The pipe was loaded on these barges from a pipe rack on shore which extended about 50 feet into the water. A slip was dredged to the rack for the small barges. The pipe was rolled from the rack on wooden supporters built on top of the barge deck to the exact height of the loading rack. These wood supports facilitated the loading job and prevented the pipe from getting wet as the waves washed over the barge deck while being towed to the work barge.

In unloading the pipe on the work barge, the small barges were tied up on the windward side so the wind and waves would keep the small

Combination cleaning and priming machine on main land line

Welding on barge used in crossing Nueces Bay

Aligning pipe to make last weld on Nueces Bay crossing

barges pushed against the large barge. The work barge was held in position by two "spuds" made out of 3-inch pipe. The bed of the bay was so soft the spuds could be pushed down by hand and in some places they would sink by their own weight. The spuds were placed near each end of the barge and as the barge was moved forward they were pulled by a small winch with a line strung through a block hung from the top of the leg support over each spud. The winch was driven by an automobile engine set up on the work barge.

Welding of each successive joint of pipe was done entirely on the work barge, equipped with two wooden rollers at each end. The joint to be welded rested on the rollers and was backed up end to end with the preceding joint. As each joint was welded the barge would be moved forward another length and another joint rolled from the small barge to the rollers. These wooden rollers permitted the barge to be moved out from under the pipe.

As each joint was welded, the barge was pulled forward by the automobile driven winch by running a line from the winch through a block fastened to the rear of the barge and hooked to the forward end of the line. As the line pulled on the pipe, the barge would slide forward. It was kept in line by the motor boat or "mud-hen" which was always tied to the barge.

While the crossing was being laid, three and a half joints of pipe were kept out of the water. The pipe was supported by the small barges tied behind the work barge and as the work progressed, the pipe was lowered into the water over a wooden roller on the rear of the small barge.

As each joint was welded to the line, approximately 8 inches were left uncoated and unwrapped, but as the barge moved forward and while the next joint was being welded, the doping crew on the small barge cleaned, primed, coated and rewrapped the section and inspected the full section for holes and unprotected spots.

River clamps weighing 800 pounds each were installed on the line every 100 feet.

Permit to close the Avery Ship Channel for 24 hours has been granted and this crossing is scheduled to be made this week. The total length of the channel from water edge to water edge is approximately 1,400 feet and the crossing is to be made by floating the pipe across.

Three sections of 481-foot lengths have been welded and placed inside of 8-inch protection pipe. The 6-inch was centered in the 8-inch pipe by slugs. The three sections were bull-plugged and the annular space between the 6- and 8-inch pipe filled with hot grease which was pumped in under 40 pounds pressure. The total weight per foot after the sections had been filled with grease was 52 pounds, making a total weight of about 75,000 pounds for the three sections. The sections were tested with 800 pounds water pressure.

As the pipe is floated out, the three sections will be welded together and the 8-inch pipe will be given a primer coating, two coats of enamel and wrapped with asbestos felt. The line will be laid in a ditch 15 feet below the bottom of the channel.

The completion of this line gives the Placedo field its first major outlet. The oil heretofore has been shipped by tankcars and through a short line to a small refinery at Port Lavaca. The field has a daily average of 7,800 bbls. from approximately 129 wells.

It will be several weeks before the line is put into actual operation. The company has under construction a large terminal on the west end of the Corpus Christi Ship Channel and is scheduled to start construction of a 5,000-bbl. Dubbs cracking unit near the terminal site. The oil from the field will be boosted through the line by one pump station in the field.

THE MARKETS*

CRUDE OIL: *Evidence of an intention on the part of the chief producing states to keep output close to the Bureau of Mines estimates of requirements has improved the tone of the crude market. In East Texas, where posted prices recently were raised 8 cents, reports are that premiums now are being paid on top of the new price.*

REFINERY: *Impetus to gasoline movement imparted by triple holiday, with quotations headed higher. Likelihood of price advances is spurring jobbers to early buying of fuel oil for fall needs. Heavy fuels in demand. Natural gasoline holding its contraseasonal strength.*

TANK-WAGON AND SERVICE STATION: *Gasoline firmer in Standard of New Jersey territory. Price-cutting reported in Mid-Continent and some other areas.*

FINANCIAL: *Oil shares suffered with the rest in a general market decline. Average of 30 representative stocks for week ending May 28: High, 41.67; low, 40.47; close, 40.97. Week ending May 22: High, 41.31; low, 38.74; close, 41.26.*

**Detailed information in Market Section.*

Over 400 oil men in the East Texas field gathered at the chapter meeting of the American Petroleum Institute in Kilgore, May 25

Brighter Prospect Faces Engineering Graduate This Year

By T. F. SMILEY

A brighter outlook spreads before the engineering graduate of 1937 who has been planning to enter some branch of the oil industry. It was hard going during the depression.

Even after the Carter apprentice has passed his tests and become a full-fledged welder he must have much field experience before he is allowed to weld casing, an exacting job. This was in the Fitts pool

Men turned out by schools received a sympathetic but positive shake of the head when they removed cap and gown and asked for a job. Indications are that men who finish engineering courses this year will find openings with little or no difficulty. A large percentage already have been engaged.

With the return of better days and expanding operations oil companies face the necessity of rebuilding technical personnels which shriveled during the years of vanished earnings. Representatives of important companies have looked over seniors receiving engineers' diplomas this month and offered positions to those whom they regard as particularly promising or as likely to fit especially well into their organizations. Many young engineers will step directly from the classroom to the oil lease, the refinery or some other zone of petroleum operations.

Additional evidence of improved conditions is the revival of oil company training courses, designed to round out college work with actual field experience or to help present employes equip themselves for more exacting and higher-salaried positions, at the same time strengthening the company's technical staff. The Doherty Junior Engineer Training School, one of the better known of these projects, is active again. So are educational programs of other companies, for all see the growing need of technically trained men and the importance of preparation to meet that need.

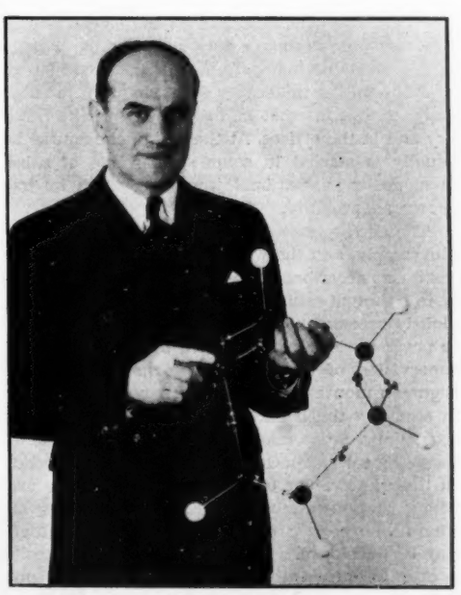
The Doherty training school, operated by the Empire Companies from the headquarters office in Bartlesville, Okla., adopted 21 years ago the plan of giving engineering graduates positions in its organization and putting them through a course of actual field, plant and laboratory work while paying them salaries. These young men were under expert supervision and instruction. As their proficiency increased and their individual aptitudes were revealed they were assigned to higher posts for which their qualifications fitted them.

The Doherty school, virtually dropped in 1931, when the red-ink industry was the only one that flourished, was resumed last year. The students, instead of being drawn from 1936 graduating classes, were young men who had come to the company during the era of stagnant business, glad to take whatever jobs might be available. Men with bachelor degrees went to work as roustabouts, gaugers, pipe line laborers, with no promise of promotion. Better times have changed their prospects. One graduate in civil engineering, for example, was delighted to go to work as a truck driver. It was better than going on relief. With restoration of the school last year he was put at the work he had studied at college, on his way once more to advancement in his chosen line.

The Doherty junior engineer gets thorough drilling in construction work. Installing aftercoolers and manifold at the Petrolia (Kans.) compressor station of the Cities Service Co.

This year, however, recruits are being drawn from engineering schools. As in predepression years application blanks were mailed to these institutions, along with information concerning the Doherty Junior Engineer Training School. Members of graduating classes who chose to do so filled out applications and sent them to Clay Briggs, chief engineer of the company, with references concerning their qualifications. Later the applicant was advised as to whether he had been selected to report for an interview. Those selected for interview made the trip to Bartlesville at the company's expense. During the interview the training work was discussed. The applicant, if accepted as a junior engineer entered into a contract to return upon graduation for active work.

During the two-year training period the junior engineer is sent to various field and office properties for practical experience. The assignments vary from six weeks to four months, depending on



Dr. G. P. Koch, Shell Oil Co., explains the structure of a hydrocarbon molecule

the work to be covered. At the end of two years each man has had opportunity to study under skilled supervision the different divisions of the company's business, including all details of production, refining, transportation, construction, pipe line work, etc. Educational features in addition to this practical experience are provided.

The salary during the training period is $125 a month. The company meets the expense incurred in transferring the student from one assignment to another. No charge is made for time or service devoted to training him. As soon as he becomes proficient in one operation he is moved to another. To determine his proficiency he is subjected to a test in each department.

Advancement depends upon the student's ability and application. Seniority is of secondary consideration. Evidence of this is seen in the fact that most of the company's executives and department managers are relatively young men who have forged ahead on sheer merit.

More than 360 men from 74 technical schools have been enrolled in the Doherty training school since it was established, and 137 of them have remained with the Empire or affiliated companies. It is planned to take on about 10 new students each year. There thus will be about 20 junior engineers under instruction all the time.

School for Salesmen

The Cities Service Sales School is another Empire project. It offers a full-time course and a correspondence course. The student in the full-time course may already be an employe or he may be a newcomer who has decided to take the training offered and then go into the service of the company. In either case he is a young man who is believed to have sales ability.

First the student is sent to a refinery, where for three months he is put at different jobs which enable him to acquire a working knowledge of the various plant processes and of the products. From the start he receives proficient instruction and coaching. Then he spends several weeks in various offices, learning how records are kept and obtaining a general idea of office administration. In addition to this practical work he receives a set of five booklets, each a textbook on some phase of the oil industry. The first one treats oil company organization, with particular reference to Cities Service methods and policies. The others discuss crude petroleum, origin, properties, geology, production, well operation, etc.; refining, including detailed explanation of processes, laboratory work and the principal derivatives; salesmanship, covering the salesman's duties and the psychology of his vocation; marketing, accounting and so on.

The student undergoes tests not only in these subjects, but in what he has learned in the refinery and in the offices. At the end of the course he usually is started in some special line of salesmanship or promotional work for which he has shown adaptability.

The correspondence course is designed for employes only, and the work is restricted to the five textbooks described. From 175 to 200 men are likely to be found taking this course, all of them previously recommended by their superiors as likely to profit by it. Tests are taken by mail under the supervision of L. D. Mann, of the Tulsa office. Eighteen months to two years may be consumed in studying the booklets and undergoing the examinations. Some take the course with a view of becoming salesmen. Others take it simply to broaden their knowledge of the oil business. Many are filling station attendants, refinery workers or others who believe they have sales talent which may be developed.

A quite different type of enterprise is the educational refund plan put into operation in September, 1935, by the Carter Oil Co. and the Oklahoma Pipe Line Co., subsidiaries of the Standard Oil Co. (New Jersey). This plan is designed to give financial help to employes who want to enroll as students in approved educational institutions for courses which should enable them to become more proficient in positions already held or fit them for advancement to higher positions.

The plan is open to all regular employes who have been in continuous service for one year. The employe, before enrolling in any course, must submit an application through his supervisor. All applications are passed on by a committee of three appointed by the management. To receive the approval of the committee the course selected must have a direct bearing on the work being done or upon the higher grade of work which is expected to be done as soon as the employe is qualified.

Junior engineers join the pipe line gang in laying gathering lines

Refunds Made to Student

The employe pays all expenses involved, but on completion of the course the company refunds one-half of the tuition and registration fees. The refunds do not include the cost of textbooks, laboratory breakage fees, etc., and they are conditioned upon the employe having attained sufficiently high grades in class work. The grades are reviewed by the same committee that passes upon the original application. No refunds are granted on a course in which a grade of less than "fair" or its equivalent is received. The total refund for any one year may not exceed $100. All work in connection with a course must be done on the employe's own time. Thus night schools are taken advantage of by most of those who enter the plan. Though preference is given to classroom instruction under competent teachers, correspondence courses are used where no local school offers the work desired or where the working hours make classroom attendance impossible.

In the first full year of operation of the plan $708.25 was refunded to 59 employes of the Carter and $152 to 18 employes of the Oklahoma Pipe Line Co. The courses most frequently chosen, in the order of their popularity, are accounting, mathematics, stenography and law.

Another educational plan which is yielding tangible results and helping to meet the heightening demand for technical skill is the Carter's course in welding instruction. Here a properly qualified employe is assigned to a job as welder's helper, and while actually working in this capacity he receives scientific training in acetylene welding technique. In order that he may apply what he learns he is allowed to practice (on his own time), using company materials under competent supervision provided by the company. During this apprenticeship as soon as he is considered qualified by his supervisor, he is put to work at "non-strength" welding jobs; that is, jobs in which the element of strength is not a prime factor. For instance, he would not be allowed to work on tank welding, but he might be assigned to welding the fence around a central power plant and to various minor jobs about the lease. In the meantime he receives wages as a welder's helper.

At the end of the course of instruction the apprentice is subjected to an examination. If he passes he becomes an acetylene welder. Then he goes through a similar course in arc welding, with an examination in that branch. If this arc-welding test is passed, the student becomes a full-fledged welder, commanding excellent wages and with a promising field for advancement. The practical value of the welding school is seen in the fact that some men who had taken repeated tests over a period of years, with a view of becoming welders, failed invariably until they had received the benefit of the company's course of instruction.

Although the expenses incurred by the company in providing material, equipment and expert instruction for the welding course are a substantial item, it regards the resulting benefits as compensating for them. Modern machinery can be ruined by incompetent workmen.

School "On the Road"

An innovation in the field of oil education is offered by the Shell Oil Co., which after conducting an annual training course at company headquarters in San Francisco for several years has put the school "on the road" and will reach more than 1,000 men in the field without disruption of the company's marketing activities.

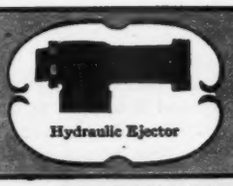
The course includes petroleum geology, production and refining, with special emphasis on the manufacture of leading Shell products. Particular attention is paid to industrial lubrication. To present this information to field men in the most interesting and readily assimilable form, the school is equipped with what is virtually a complete laboratory, carried in a specially built truck. This laboratory is set up in a half-hour in classrooms wherever the school session is held.

Shell refineries in effect are brought into the classroom by means of giant photographs mounted on rolling curtains, and students follow the manufacturing processes straight through from crude oil to finished products. Scores of lubricant samples are displayed, and their important characteristics are demonstrated. Ingenious working models of fundamental gears and other mechanical devices drive home the principles of automotive and industrial engines and show why proper lubrication makes them operate efficiently.

Dr. G. P. Koch, of Shell's Martinez refinery staff, is in charge of the school, which opened its sessions in San Francisco, then went on a tour which includes Seattle, Vancouver, Portland, Spokane, Salt Lake City, Phoenix, Los Angeles, Fresno, Sacramento and Oakland.

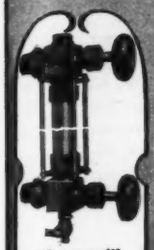
With a class of 89, the largest in its history, the Bayonne refinery school of the Tide Water Associated Oil Co. recently brought the total of its graduates since it was established 12 years ago to 681. Designed originally to train employes for the operation of modernized equipment as rapidly as it might be installed, the school has served not only to keep workmen abreast of new developments, but to heighten efficiency and morale.

The school is credited with an important part in the exceptionally low employe turnover. Process men now serving have an average experience of 17 years with the company. The courses include processing, plant mathematics, power plant engineering, and fuels and firing. All expenses of the school are borne by the company.


Hydraulic Ejector

PENBERTHY PRODUCTS

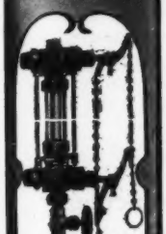
Steam Ejector


"Safeguard" Automatic Liquid Level Gage

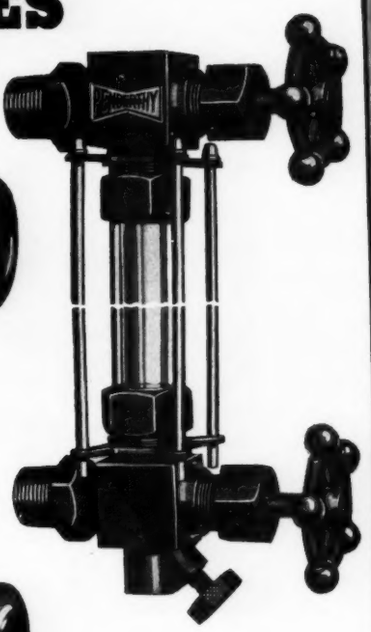
Automatic Injector

PENBERTHY LIQUID LEVEL GAGES

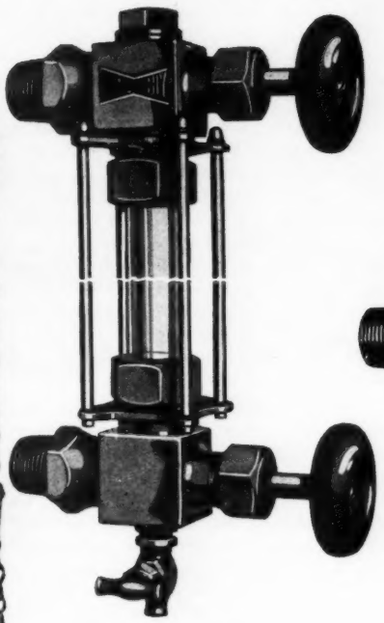
MEET ALL OIL INDUSTRY NEEDS


"Navy Type" Liquid Level Gage

Gas Engine Lubricator

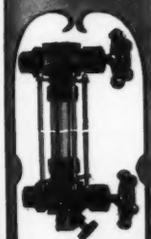


"ALL IRON"
500 LBS. WORKING PRESSURE
750° F.



"SAFEGUARD"
300 LBS. WORKING PRESSURE
500° F.

"NAVY TYPE"
350 LBS. WORKING PRESSURE
500° F.


"All-Iron" Automatic Liquid Level Gage

Snap Lever Oiler

PENBERTHY PRODUCTS

THE three gages shown here are very popular in the oil industry because of their consistently dependable operation. All of them are ruggedly built of the highest grade materials by an organization that has had 48 years experience in the manufacture of quality products. The "Navy Type" is made from Navy Bronze Composition M, the "Safeguard" from high grade steam metal bronze and the "All Iron" from a modern electric iron alloy.

All these gages have automatic shut-off. Both upper and lower body have ball check valves that seat immediately and positively to prevent the loss of liquid when glass is broken. The hand operated stop valves may then be closed with safety and a new glass inserted.

Each gage is carefully tested and rigidly inspected at the factory. For detailed descriptions write for a copy of the new catalog.

Penberthy Liquid Level Gages are carried in stock by supply houses everywhere.

Automatic Cellar Drainer (Water or Steam Operated)

Automatic Electric Sump Pump

PENBERTHY INJECTOR COMPANY

DETROIT, MICHIGAN
WINDSOR, ONTARIO

MANUFACTURERS OF QUALITY PRODUCTS SINCE 1884

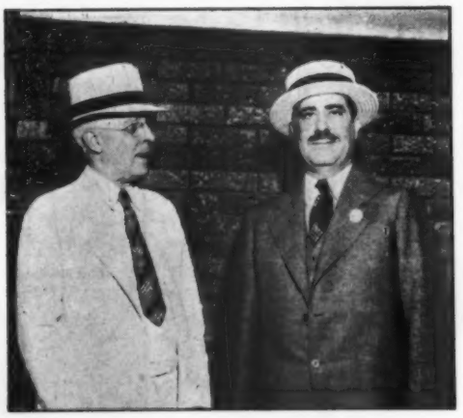
Spring Compression Grease Cup

Plain Compression Grease Cup

Screw Plunger Grease Cup

Tulsa Exposition in 1938 to Be Greatly Enlarged

With workmen busy enlarging the 20-acre plant to take care of the greater number of exhibits in prospect for the May, 1938, International Petroleum Exposition in Tulsa, officials began this week building up attendance by inviting the American Petroleum Institute to hold its next mid-year meeting in conjunction with the exposition. The invitation was presented at the Colorado Springs meeting this week.



OFF FOR PARIS—Dr. C. K. Francis and D. E. Buchanan

General Manager W. B. Way announces plans for enlarging the exposition plant call for a new brick restaurant of modernistic design. The east fence will be moved back 150 feet and a street constructed similar to Drake Drive at the west end. New entrance gates will be placed at the east end and openings from the new street provided to the California, Scientific and Technical, and Refiners and Marketers buildings. The arcade booths between the Texas and Scientific and Technical buildings have been removed and will be rebuilt along the side of the California Building to provide additional outside exhibit space. An additional 20,000 to 30,000 square feet of outside exhibit space will be added to the plant, which now has 79,600 square feet of inside booth space and 103,600 square feet of open-air booth facilities.

One of the most important additions will be an increase of electric power facilities to take care of large moving exhibits. With each exposition there have been more moving displays of heavy equipment in actual operation.

Committee appointments for the 1938 Tulsa Exposition are now being considered and the groups will be put to work soon, said President W. G. Skelly. One of the most important will be the scientific committee. A large portion of the Scientific and Technical Building will be devoted to exhibits collected and arranged by this committee.

Another special committee will arrange for celebration of the fifteenth anniversary of the Tulsa show, the oldest and largest oil exposition. It is planned to have a display of the advance made in equipment used by the petroleum industry since the first oil show was held in Tulsa in 1923.

Foreign attendance, which has always been an important part of the show, including representatives and delegates from 16 to 25 nations, will probably reach a peak in 1938. A special campaign is now under way to attract the oil nations to the next Tulsa exposition.

Dr. C. K. Francis, technical editor of The Oil and Gas Journal, official exposition delegate to the World Petroleum Congress in Paris this month, will present the formal invitation to the congress to hold its 1940 meeting in Tulsa in conjunction with the eleventh International Petroleum Exposition.

Officially representing the United States, the International Petroleum Exposition and the American Petroleum Institute, a group of oil men embarked on the Normandie June 2 from New York to attend the congress in Paris June 14 to 19. D. E. Buchanan, president of Hanlon-Buchanan, Inc., of Tulsa, is chairman of the delegation named by President Roosevelt and Secretary of State Cordell Hull to represent the United States. Mr. Buchanan is also chairman of the Tulsa Exposition civic committee. Others in the party sailing on the Normandie are:

Herbert Baxley, Socony-Vacuum Oil Co., New York; Jack Colvin, Huntington Beach, Calif.; Dr. Gustav Egloff, Universal Oil Products Co., Chicago; Robert Ballentine, National Union Oil & Gas Co., Blackwell, Okla.; H. W. Gilbert, Gilbert Oil Co., Beaumont, Tex.; Mr. and Mrs. Frank W. Hall, Texas Co., New York; George A. Hill, Jr., Houston Oil Co., Houston, Tex.; Prof. V. Ipatieff, Universal Oil Products Co., Chicago; Ward Keller, San Antonio, Tex.; W. G. Phillips, oil producer, Tulsa; Mr. and Mrs. T. N. St. Hill, Petroleum Rectifying Co., Los Angeles, Calif.; Mr. and Mrs. H. C. Sanders, Root Petroleum Co., Houston, Tex.; E. O. Thompson, Austin, Tex.; C. B. Veal, research manager, Society of Automotive Engineers, New York; Mr. and Mrs. T. Sutter, Los Angeles, Calif.; Misses Evelyn and Audrey Roberts, Blackwell, Okla.; and H. F. Worley, oil producer, Tulsa.

W. C. Teagle and W. S. Farish In Exchange of Positions

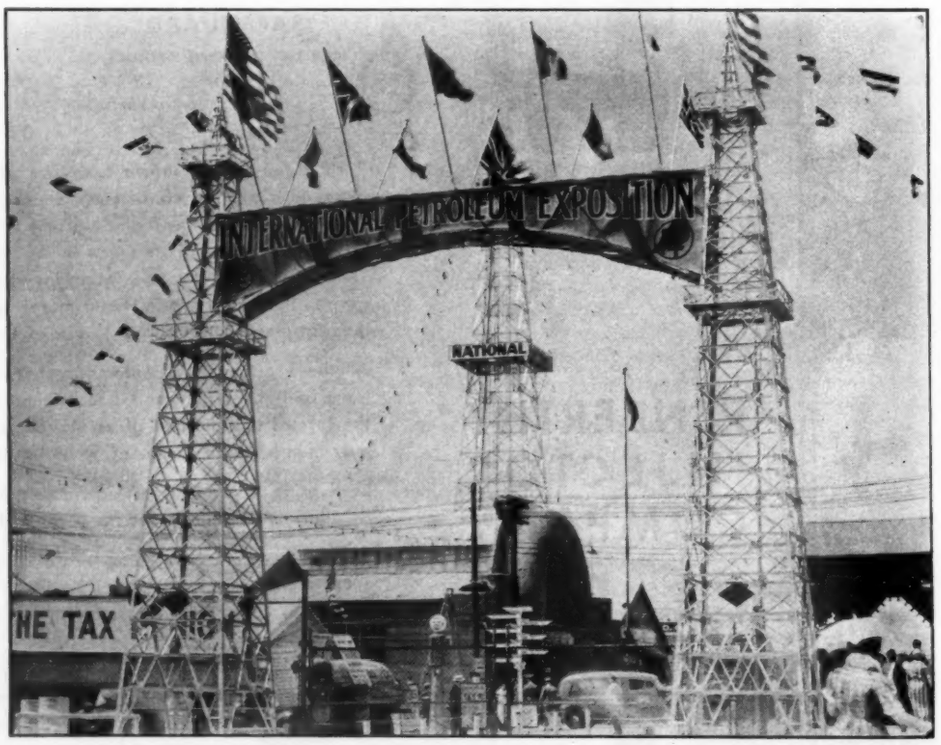
NEW YORK, June 1.—Walter C. Teagle resigned as president of Standard Oil Co. (New Jersey) at the company's annual meeting in New York today and was made chairman of the board. W. S. Farish, formerly chairman, resigned from that position and was elected president, the chief executive officer of the company, succeeding Mr. Teagle. Wallace E. Pratt, an executive of Humble Oil & Refining Co., was made a director of New Jersey, filling the vacancy created by the recent death of Chester O. Swain.

To Probe Depletion Deductions

WASHINGTON, D. C., June 1.—President Roosevelt sent his tax evasion message to congress today requesting immediate congressional action to close loop-holes and authorization for a special treasury investigation of other possible defects.

A letter from Secretary Morganthau listing tax loop-holes and abuses made part of the message.

Oil and mining companies were cited in this letter as avoiding income taxes through depletion deductions which continue, according to the letter, "even though the cost of the property has been completely recovered." This was called "the most glaring loop-hole in our present revenue system."



The main gate of the International Petroleum Exposition at Tulsa showing the American Petroleum Institute exhibit at the 1936 show just inside. The A.P.I. will again have a special exhibit at the 1938 Exposition. Through the gate is Drake Drive. A similar street will be constructed at the east side of the grounds

The very nature of the fabrication of Wisscolay Preformed Wire Rope automatically equalizes the lengths of the various strands. There are, therefore, no long drones nor short units that fail from overwork before their time. Every wire and strand assumes its equal share of the load. The resulting longer life of Preformed Wire Rope makes it a most economical rope. Practically all constructions can be made in Preformed. Tell us your use of wire rope and we will gladly recommend the best Wisscolay Preformed for your purpose.

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Pipe Line Activity

Rio Vista Gas Line

LOS ANGELES, Calif.—Pacific Gas & Electric Co. has completed plans to lay the new natural gas line from the Rio Vista gas field of Solano County to connect with existing facilities. The company applied to the California Railroad Commission for authority to make an expenditure of $900,000 for construction costs. Behind the pipe line project is a contract with Amerada Petroleum Corp. which calls for an average daily supply of 10,000,000 feet of gas from the Rio Vista gas field, where Amerada has eight completed wells and Standard Oil Co. one.

The new line will be 58¼ miles long. The section from the field to a point near Dixon will be 5¾ miles long and consist of 12-inch pipe. There will be 26 miles of 10-inch line to Napa station, where connection will be made with the Kettleman line across the Carquinez bridge to Pataluma. Another 10-inch line of 14½ miles will hook up the Rio Vista main trunk with the 6-inch line between Dixon and Davis. The company will lay 12 miles of new 8-inch line from Davis to the Spreckels beet sugar factory. Coincident with the project, the company is negotiating with the Natural Gas Co. of California for acquisition of butane gas distribution systems in Rio Vista, Fairfield, Suisun and Vacaville.

Harbor Island Projects

HOUSTON, Tex.—Facilities at Harbor Island, principal crude shipping point on the Gulf Coast, will shortly be enlarged by addition of 400,000 bbls. of storage by Humble Pipe Line Co. In addition, Atlantic Pipe Line Co., which also operates a terminal on the island, will construct new storage. The Atlantic lines are being cleaned and repainted along the 6 miles of causeway crossing from the mainland near Aransas Pass to Harbor Island. The Aransas Harbor Terminal Railway Co., which operates the harbor, has announced plans for enlarging terminal facilities available to the two major oil companies.

New East Texas Line

SHREVEPORT, La.—Rumors of the building of an independent oil pipe line from the East Texas field to the Gulf Coast have again broken out following the price increase and the rapid changing of well connections in the field. Information is now that negotiations are nearing completion, and that E. N. Stanley, chief enforcement engineer for the Texas Railroad Commission, will soon tender his resignation to accept an executive position with the organization building the proposed line.

O'Hern Area Outlet

CORPUS CHRISTI, Tex.—The O'Hern area of Webb and Duval counties will be included in the Crude Oil Pipe Line Co. system when the line of the newly formed O'Hern Pipe Line Co. is completed. The new line, a 4-inch welded extension, will connect the O'Hern field with the Crude Oil Pipe Line field terminal in section 77 of the Loma Novia field. This gives it outlet through the 72-mile Crude Oil company line to Corpus Christi. Work has begun on the new 33-mile line. The O'Hern Pipe Line Co. is affiliated with Crude Oil Pipe Line Co.

Labor Board Precedent

WASHINGTON, D. C., May 31.—Belief that the National Labor Relations Board would not hold a firm in interstate commerce unless more than 50 per cent of its sales were outside the state of its domicile, was shaken by the board's decision in the case of the Shell Oil Co. of California applying the Wagner act. The board found that only 1.13 per cent of the material used in manufacture came from outside of California. Of the products sold by the company it was estimated approximately 62 per cent were sold in California and only 38 per cent elsewhere.

Natural Gasoline

Building New Texas Plant

FORT WORTH, Tex.—Roeser-Pendleton, Inc., of Fort Worth are now erecting the first casinghead gasoline plant in the extreme western part of Shackelford County. The plant is located on the Dawson-Conway ranch, about 17 miles west of Albany. It is to be used for repressuring and recycling gas in the Bluff Creek pool in the area surrounding the plant, the company holding the greater part of the production in the pool. It will have four units, with a daily gas capacity of around 2,000,000 feet and a maximum working pressure of 350 pounds for gas return; using the same system used by the company and the Humble Oil & Refining Co. in repressuring the Cook pool, to the east, in the same county. Carl A. Davis is in charge of the construction and Paul Armstrong will be plant engineer. Gas will also be taken from the J. P. Morris ranches.

California Production Unchanged

Natural gasoline production in California during April remained at 40,000 bbls. daily, but refinery utilization increased 4,000 bbls. daily to 33,000 bbls. daily, according to the Bureau of Mines report for that month. Stocks increased 71,000 bbls. during the month and amounted to 2,380,000 bbls. as compared with 1,891,000 bbls. on May 1, 1936.

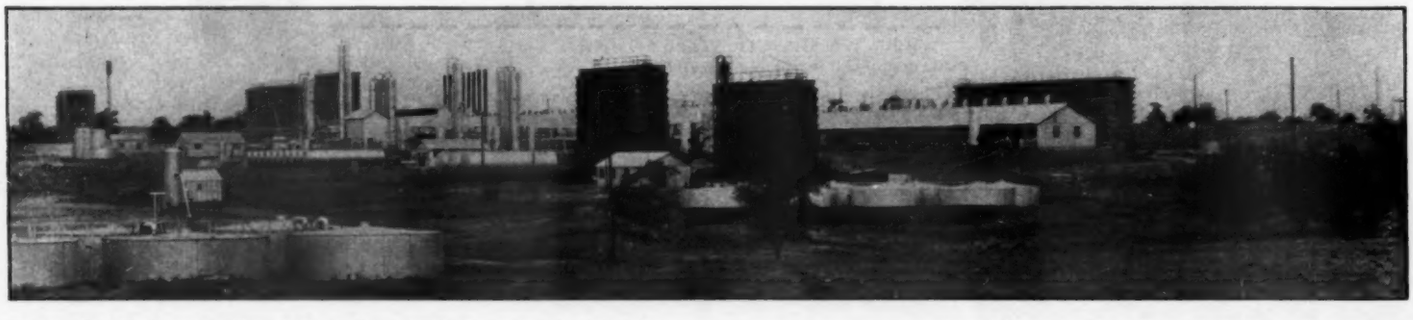
Daily average production of liquefied petroleum gases increased from 1,771 bbls. to 2,198 bbls., of which 530 bbls. were produced at refineries in April. Daily average sales increased from 1,824 bbls. to 2,263 bbls. Still gas production during April amounted to 2,135,812,000 feet, equivalent on a B.t.u. basis to 563,922 bbls. of fuel oil. A summary of natural gasoline operations for the month is as follows:

Field—	Gas treated (M.cu.ft.)	Natural gasoline produced (gallons)
San Joaquin Valley:		
Elk Hills	56,695	111,998
Kettleman Hills	10,062,096	14,369,152
Midway-Sunset	1,203,155	2,200,850
Mountain View	812,193	897,314
Miscellaneous	3,638,707	2,395,981
Coastal Region:		
Elwood	717,986	1,000,486
Rincon	107,763	173,425
Santa Maria	131,982	375,731
Ventura Avenue	3,018,519	4,276,452
Miscellaneous	467,768	402,836
Los Angeles Basin:		
Brea-Olinda Coyote	605,423	1,692,832
Dominguez	1,409,551	2,099,726
Huntington Beach	1,526,314	3,704,176
Inglewood	282,424	376,802
Long Beach	1,675,621	7,313,531
Playa del Rey	358,728	1,200,224
Richfield	220,535	417,891
Rosecrans	398,536	537,605
Santa Fe Springs	2,238,266	4,855,531
Seal Beach	495,740	662,557
Torrance	103,180	226,609
Miscellaneous	422,935	768,197
Total (all fields)	29,954,167	50,059,906

Distribution

	Gallons	Gallons
Stocks beginning of month	2,398,697	
Production during month	50,059,906	
Delivered to refineries		45,070,567
Delivered to jobbers, brokers or blenders		5,117,897
Blended at plants for production of motor fuel		10,063
Losses		38,868
Stocks end of month		2,221,208
Total	52,458,603	52,458,603

Liquefied petroleum gas production	2,101,234 =	50,029 bbls.
Motor fuel produced	16,533 =	394 bbls.



Carter Oil Co.'s natural gasoline plant in the Fitts pool of Oklahoma. A new compressor station has just been completed at this plant, which is of the absorption type and has a daily capacity of 40,000 gallons. The gas capacity of the plant was enlarged about one year ago by the addition of eight 230-hp. compressors and additional absorption and distillation equipment

Natural Gas News

California Gas Operations

LOS ANGELES, Calif.—Discoveries of substantial accumulations of dry gas in the Delano, Semi-Tropic, Tracy, Goleta, Buttonwillow, Rio Vista, Buena Vista Lake and McDonald Island gas fields have greatly increased California gas reserves. Recognizing this, public utilities have laid additional gas lines and natural gas is being used for domestic consumption and manufacturing from Sacramento and Stockton to San Diego. Gas company records indicate California companies took delivery of approximately 60,000,000,000 feet of gas during the first quarter. Of this, 56 per cent was used for domestic and commercial consumption, largely heating, 30 per cent for industry and pumping, 6 per cent for electric generation, 2 per cent by utilities and 6 per cent unaccounted for.

Pacific Gas & Electric Corp. has announced intention of immediately laying a gas line into the Rio Vista gas field of Solano County and this district will go on commercial production for the first time since discovery by Amerada Petroleum Corp. This company has completed seven good gas wells on the Emigh, Drouin, Happe, Hamilton, Serpa and Mayhood leases in the Rio Vista gas field and has just finished another, No. 1 Marks, at 4,450 feet. This well was shut in immediately without making a production test. Other gas wells in this field have averaged around 40,000,000 feet per day and No. 1 Marks should be as good. Standard Oil Co. has completed one well on the Anderson lease at Rio Vista but has not undertaken any recent developments.

Extension of Pacific Gas & Electric Corp.'s pipe line into the Rio Vista gas field indicates that this company or Standard Oil Co. will sooner or later provide pipe line facilities for gas wells completed in the McDonald Island gas field discovered by Standard Oil Co. Two new wildcats are being started in search of additional gas fields. Southeast of the Rio Vista gas field, Standard is starting work on No. 1 Woods, a wildcat in section 24-1-5, and Texas Co. is building rig for No. 1 Laurence Stevens, which will be drilled on Roberts Island in section 8-1-6, about 10 miles north of the Tracy gas field.

Buttes Oilfields, Inc. is working on a wildcat about 12 miles west of Marysville in Sutter County on the south flank of the Marysville Buttes that may result in the discovery of a new gas field if the fishing job is successful. The gas in this test, in section 2-15-1, which has necessitated the use of 80-pound drilling mud, is coming from a sand in the Lower Chico horizon of the Cretaceous series which underlie the Sacramento Valley and abut against an enormous volcanic plug which forms the core of the Marysville Buttes. No. 4 of Buttes Oilfields, Inc. has penetrated the Cretaceous horizons to a greater geological depth than any oil or gas well drilled in California. After logging high gas pressure at 5,098 feet, the company resumed drilling in hope of encountering crude in the Chico series, from which oil has been seeping near Mountain House. At 5,090-5,164 feet, the bit entered a gas zone of considerably higher pressure than that found at 5,098 feet and tentative plans call for completion at 5,830 feet as a gas well, as it has been found practically impossible to recover all of the "fish." Formation tests indicate possible completion of a gas well with a potential somewhere around 30,000,000 feet. Amerada Petroleum Corp., which has leases on several thousand acres due west of the wildcat of Buttes Oilfields, Inc., has drilled three shallow structure survey holes on its holdings, but what was found in these 2,500-foot holes has not been disclosed. Standard Oil Co. has large holdings northwest of the wildcat now being drilled on the Marysville Buttes and much of the acreage has been subjected to seismographic tests.

Alberta Helium Prospects

CALGARY, Alberta.—The destruction of the Hindenburg has drawn attention to possibilities of helium in Alberta. Extensive helium experiments were carried on by the late Sir John McLennan at Calgary during the war, when it was found possible to extract a fair percentage of helium from the gas produced in the Bow Island field. This field, however, has since been practically depleted, and the experimental work was discontinued.

Turner Valley waste gas, burned in open flares to an estimated amount of 240,000,000 feet a day, contains some helium, but experiments indicate the helium content is not more than .3 per cent. While this represents an apparent waste of 720,000 feet of helium per day, economical extraction is believed possible only where at least 1 per cent of helium is present.

Refinery Projects

Naph-Sol Resuming Operations

MUSKEGON, Mich.—After being virtually shut down since March 31 by labor trouble, the Naph-Sol Refining Co., of Muskegon, last week made a tentative settlement with members of Local 390, Oil Field, Gas Well and Refinery Workers union, resulting in discontinuance of picketing and the start of gradual resumption of plant operations.

Peace negotiations were conducted between members of the bargaining committee of the C.I.O. unit and Walter E. Anderson, president of the refinery company. The company offered to increase the minimum wage to 50 cents an hour, about a 10 per cent rise. Further negotiations as to wages, hours and working conditions are to be conducted later, though the union had not yet been officially recognized by the management.

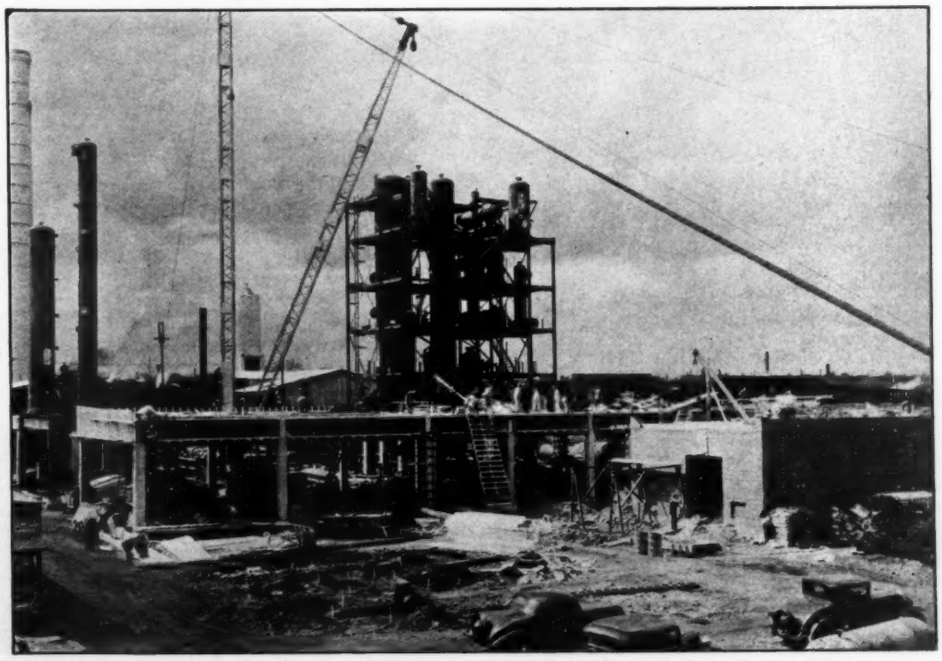
New California Refinery

LOS ANGELES, Calif.—Yosemite Refining Co., recently incorporated and headed by J. L. McBlath and Lloyd A. Seaman, has started construction of new refinery near Bakersfield and present plans call for completion of construction work within six weeks. This new installation, which will have a daily charging capacity of 2,000 bbls., will run to gasoline, kerosene, distillate and fuel oil. Crude oil for charging stock will be moved to the plant by truck from Round Mountain, Fruitvale, Mount Poso and Mountain View fields.

The Walter Steiner refinery at Signal Hill has been leased to Long Beach Oil Refining, headed by Lauren D. Cherry and John S. Storh. The firm is said to pay a rental of 5 cents a barrel with a minimum guarantee of $1,000 per month.

New Southwest Texas Plant

HOUSTON, Tex.—Construction will shortly begin on a 1,000-bbl. skimming plant to be erected by the Refugio Refining Co. in the newly opened La Blanca field of Hidalgo County. The field, located in the heart of the citrus belt in the Lower Rio Grande Valley, produces a high gravity crude. The plant, which is estimated to cost $40,000 will process the crude for straightrun products. In addition the construction of a natural gasoline unit is contemplated by the operators, to process the wet gas from the field.



Thermal polymerization plant being built by Atlantic Refining Co. at its Point Breeze refinery, Philadelphia, Pa., to produce gasoline from refinery gases. With a daily capacity of 62,500 gallons of gasoline, the plant will be the largest of its type in the world, and the first to be built in the eastern United States

EMPIRE CHANGES

J. E. Howell, general superintendent of oil production for the Empire Oil & Refining Co., has resigned, effective June 15 to become vice president in charge of production for Lion Oil & Refining Co., of El Dorado, Ark. C. S. Warren, superintendent of the Kansas division, has been appointed general superintendent of production in succession to Mr. Howell by M. R. Shaffer, general manager of the oil division.

J. E. HOWELL

EN ROUTE TO PARIS

COL. ERNEST O. THOMPSON

Col. Ernest O. Thompson, chairman of the Interstate Oil Compact Commission and member of the Texas Railroad Commission, who sailed June 2 for the World Petroleum Congress in Paris, June 14 to 19, has been appointed official delegate to represent the Oil-World Exposition. Colonel Thompson will present to the foreign oil men attending the World Petroleum Congress an invitation to the Oil-World Exposition at Houston, Tex., October 11 to 16. Numerous foreign oil men have already written to the Oil-World Exposition for hotel reservations, and information, and it is anticipated an exceptionally large attendance of foreign oil men will attend the Houston show.

Madison Court Overrules Two Defense Motions

MADISON, Wis. — Federal Judge Patrick T. Stone last week (May 27) denied a defense petition for an order restraining government attorneys from using impounded documents as evidence against oil companies charged with violating the antitrust law. He also refused to grant return of the documents, some of which have been released temporarily to aid defendants in preparation for trial in September.

Judge Stone on May 28 overruled the demurrer of P. C. Scullin, vice president and general manager of Indian Refining Co., who argued the indictment was not sufficiently specific in his case.

GEOPHYSICAL CREWS

(Continued from Page 21)

the past few years to add to geological knowledge of this region. Mamie S. McCurrey No. 1 Southern Kraft Corp., section 28-2s-4e, total depth 5,027 feet; Danciger Oil & Refining Co. No. 1 Fort Morgan, on extreme western end of Fort Morgan Peninsula, total depth 2,564 feet. Douglas Oil Co. No. 1 Robinson & Greer, section 15-9n-2w, total depth 4,028 feet; Magnolia Petroleum Co. No. 1 Scotch Lumber Co., section 17-10n-3e, total depth 6,010 feet, and Ohio Oil Co. No. 1 James Bethel, section 34-3s-2w, total depth 5,351 feet. Danciger Oil & Refining Co. No. 1 Avant, section 25-5n-4w, total depth 4,865 feet. All were abandoned as dry holes.

Alabama Operations

Present activity in Alabama may be summarized as follows:

County—	Rigs	Drlg.	Ttl.
Choctaw	0	1	1
Green	1	0	1
Houston	0	1	1
Mobile	1	0	1
Total	2	2	4

Most recent geophysical work and blocking in Alabama is reported as follows:

United Gas Public Service Co., with headquarters at Mobile, is concentrating with its seismograph crew in the southwestern part of Washington County, and portions of George and Green counties. This company plans to keep one crew at least busy in this area throughout the coming year.

Lide and Greer, oil operators of Shreveport, are preparing to drill a well in Clark County, Alabama, along the Jackson fault zone.

FLORIDA

The western part of Florida is considered to be a part of the Gulf Coastal Plain, and has been the scene of several very interesting exploratory tests. From the best obtainable records, about 75 wells have been drilled in this state in search of oil or gas, but only about 10 have been drilled deep enough to reach Cretaceous rocks, and most of these were in the northern and western part of the state north of Levy and Marion counties. The records reveal the logging of several oil and gas showings in the Eocene beds of Florida, but no commercial production has yet been found.

Probably the most carefully drilled and logged well in the state, and one which has added more than any other to the subsurface geology, is Oil Development Co. of Florida No. 2 Gulf Exploration Co., section 17-24s-25e, Lake County, about midway in the peninsula east and west, and 65 miles northeast of Tampa. Location was made on a magnetic high on southern flank of the Ocala uplift. The log of this well has been reported as follows:

"The well was spudded in on March 20, 1935, with rotary equipment. Ocala (Jackson) Eocene limestone was encountered at 65 feet (plus 55 feet sea level) and the well remained in limestone to a depth of 2,434 feet, where the massive Eocene anhydrite was encountered. This formation, with occasional lime breaks, continued to a depth of 3,066 feet. Immediately below, 300 feet of Oolitic limestone was drilled. The top of the Cretaceous (probably Ripley) was encountered at 3,443 feet, and the Selma chalk at 3,454 feet. The soft white chalk continued unbroken for 1,200 feet to a depth of 4,654 feet, when the first notable shale breaks commenced to show up. The first glauconitic green sands were encountered at 5,322 feet, probably marking the top of the Eutaw. The first true noncalcareous sand (probably Arkose) was topped at 6,050 feet and immediately below this sand, residual red beds of sand and clays to a depth of 6,012 feet, where flesh red granite was encountered. Drilling was slow from 6,102 to 6,124 feet, requiring 15 days of one tour each to make the last 3 feet. As to the granite itself, it is an Alaskite and consists of about 50 per cent orthoclase feldspar, about 40 per cent quartz, and about 10 per cent oligoclase, with small amounts of biotite and magnetite."

Schlumberger survey was made of this hole to total depth, which it is reported, confirmed earlier showings logged at shallower depths. It is now the plan to run casing and perforate opposite attractive zones.

Florida Operations

Present activity in Florida may be summarized as follows:

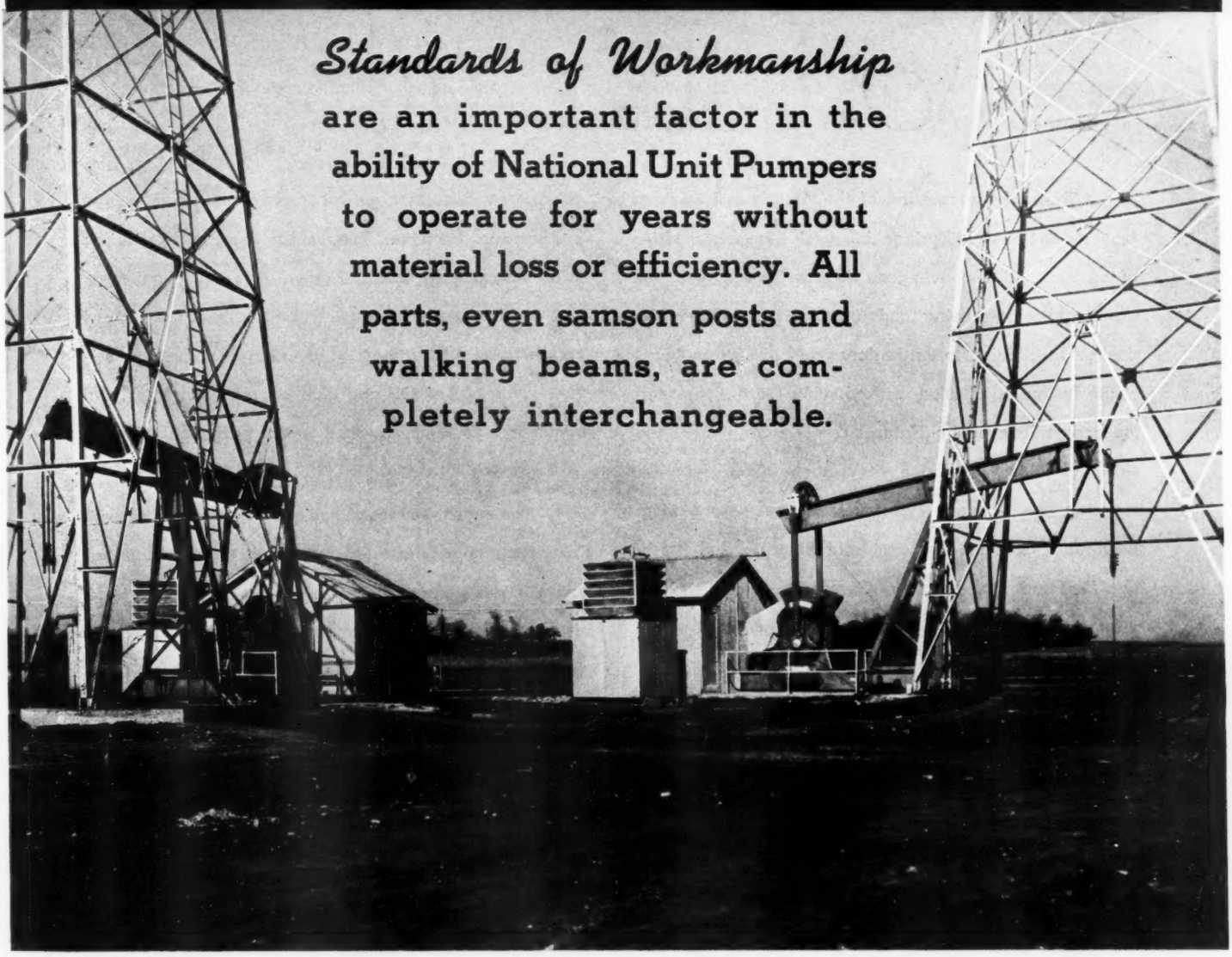
County—	Rigs	Drlg.	Ttl.
Kay	1	0	1
Lake	0	2	2
Nassau	0	1	1
Polk	1	0	1
Hillsborough	0	1	1
Total	2	4	6

Most important of the present blocking activities in Florida is the 1,000,000-acre spread recently taken by Gulf Oil Corp. in the Everglades land of Lee, Hendry, Collier and Broward counties. All of these leases were taken about one year ago by Clem S. Clarke, of Shreveport, who assigned them to Gulf for exploratory purposes under his supervision, retaining an interest in the properties themselves. At the time of assembling this acreage Mr. Clarke had a seismic crew run profiles from Miami westward into Collier County, and then as far north as LaBelle in the northern part of Hendry County. Lease stipulations provide that after two years of geophysical exploration by Gulf, selections will be made of at least 100,000 acres, if indications are favorable, and a 6,000-foot test drilled. At this southern part of the peninsula, it is expected that the Permian lime will be picked up at about 4,000 to 5,000 feet.

All Floridoil Corp. recently completed a magnetometer survey in northern Florida along the Suwanne River and south of Tallahassee, where the mapping of both the Suwanee River high and the Tallahassee Terrace has been reported. Drilling operations may be started here soon.

Florida Oil Discovery Co. is rigging up No. 1 Cedar Key Co. on the Sholtz land, section 9-15s-13e, Levy County. Rotary tools are to be used, and a carefully drilled deep test is planned. Test will be under direction of Dr. Edward A. Hill, Tampa, Fla., who drilled his first well 1,500 feet south of the present location in 1932, which was abandoned at 4,010 feet.

UNIT PUMPERS



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the OIL AND GAS JOURNAL

PRODUCING REFINING NATURAL GASOLINE PIPE LINE

Published weekly by The Petroleum Publishing Company at Tulsa, Oklahoma

On a Sounder Basis

The midyear meeting of the American Petroleum Institute at Colorado Springs this week climaxes a series of oil association conventions dealing largely with the technical progress being made in all phases of the oil industry. In addition to the regional and district meetings of the Institute's Division of Production there have been the conventions of the Natural Gas Department of the American Gas Association, the National Petroleum Association, the Western Petroleum Refiners Association, the Natural Gasoline Association of America, and American Association of Petroleum Geologists.

Increasing attention has been given in the programs to the scientific work in the industry, the development of technical and engineering practices in production, transportation, refining and even in marketing. The technologists are more firmly entrenched in the industry today than ever before.

The hit or miss, rule of thumb habits of earlier days are being superseded by scientific methods based on a long period of investigation and research development with the result of placing the industry upon a firmer basis than it has ever known.

Operations planned on facts disclosed by scientific knowledge and engineering experience tend to eliminate the peaks and valleys and to provide the industry with a level course. Science has helped not only in the search for oil but has shown how to conserve production. It has made possible the production of oil only as needed, economizing the use of reservoir energy for greater recovery.

At the same time engineering knowledge has perfected mechanical equipment to keep pace with this development. Each demand for improvement to meet new problems has been met. The successive steps are reflected in the engineering data presented at the technical meetings and in the special articles in trade literature such as presented by staff writers and contributors in the engineering section of The Oil and Gas Journal each week. No sooner is a problem solved than the technologists move on to the next.

The industry's recognition of the importance of technical training is illustrated by the fact reported in an article in this issue that there is such a demand for technically trained students they are assured of a job within two or three weeks after graduation and many have been engaged even before they had finished their course.

The significance of this is that we are now finding new reserves of oil where previously none were suspected, and we are securing greater ultimate recovery from existing fields, securing larger yields of better products and transporting and distributing our raw material and manufactures more cheaply.

The net result is that the consumer is supplied at a reasonable price, the industry is more stabilized in its operations, and the country is assured a greater ultimate recovery of this irreplaceable natural resource.

Further, the trend is even more promising. New products, new uses, larger and broader markets for the industry are indicated in this marvelous technical progress. Enough has been developed to justify confidence that the world will enjoy even greater benefits from this magical fluid as the industry reaps the results from the increasing study of the possibilities in petroleum.

Findlay Is Ready for Its Golden Celebration of Oil and Gas

FINDLAY, Ohio, June 1.—Findlay will devote the entire week of June 20-26 to a Golden Celebration of Oil and Gas, recalling the hectic days when, following the discovery of gas in large volume, the town of 5,000 people offered free fuel to factories locating there and grew to a city of 15,000. In 1887 the citizens staged a celebration designed to further boost the fame of the city, and it is the fiftieth anniversary of that fete which will be commemorated this month.

As a matter of fact, Findlay might also include the centennial of the discovery of gas in that area. A farmer digging a well for water 3 miles from Findlay, in October, 1836, tapped a spring and the water "boiled." He went to supper, returned after dark and lighted a torch to examine the well. An explosion scared him, and a flame ascended for days.

Dr. Charles Oesterlen, an expert mineralogist (almost half a century later to drill the first commercial gas well in Findlay), who had detected the odor of sulfuretted hydrogen in the town and along the banks of the Blanchard River, found the solution of his theory of a gas that would burn and serve as a fuel.

He made a cone of mud over a fissure at the quarry, covered it with a bucket, applied a light and—landed next moment in an adjoining field.

Daniel Foster, another farmer, dug a well in 1838, hit gas before striking water, rigged wooden pump-stocks for pipe, stuck a gun-barrel in the end of the joint in the kitchen, and cooked and lighted the apartment, causing Doctor Oesterlen to declare Findlay was "right over a vast caldron of gas."

People laughed at him and declined to take stock in a project to "bore a hole 20 inches across," repeating their refusals in 1864 and 1867. The persevering doctor managed in 1884 to enlist $4,000 capital and start a well east of the town where the odor was pungent and gas flowing through a tile pipe he planted in the ground burned for weeks.

At 1,110 feet, in the Trenton limestone, on November 10, gas burst forth with terrific force. Drilling into salt water at 1,600 feet, the well was plugged below the gas vein and for months 250,000 feet a day burned in the open air. The boom followed.

The well owners were under the impression that the more gas they used or burned, the more would be generated to take its place and, acting in accordance with this quaint theory, there arose an immediate necessity for utilizing millions of feet of gas. Following Findlay's offer of free fuel to factories locating in the city, during 1887 over 30 plants eagerly accepted the offer. Among these were glass plants, rolling mills, pipe mills, etc. Findlay, it appeared, was "destined to become the manufacturing center of the United States," and in 1887 the citizens of the rapidly growing and thriving city staged the great celebration designed to further boost it. Streets were arched with flowing gas lights and topped with magnificent gas flares, and every gas well in the area turned loose, turning night into day. Thousands came, saw and marveled. A few years later the gas supply dwindled rapidly. As the supply showed definite signs of exhaustion, citizens were no longer able to heat an entire dwelling for $1.05 a year, and the factories, brought in under the appeal of free fuel, noted their supply thinning and wavering. As a result, these companies folded up and departed toward Indiana and other areas where free or cheap fuel in abundance was procurable.

It was a serious blow to the little city but it rallied bravely and fought gallantly. Oil had been discovered in northern Ohio and soon Findlay,

O. D. DONNELL

recovering from the blow delivered by gas exhaustion, was again elevated by the rich and productive oil fields around the city. During this period, at Lima, Ohio, was incorporated the Ohio Oil Co., destined to become one of the important producing and marketing organizations in the United States, and which, within a few years, located its main offices in Findlay, where they have since remained, one of the most substantial pay rolls in the city.

Following the depletion of the local gas supply, the Logan Natural Gas Fuel Co. supplied natural gas, piped into the city, later merged with Ohio Fuel Gas Co.

The Golden Celebration is under the direction of O. D. Donnell, president of the Ohio Oil Co., and he has as associates the business, industrial and professional leaders of the city. Axtell J. Byles, president of the American Petroleum Institute, and R. W. Gallagher of the Standard Oil Co. of New Jersey, former president of the American Gas Association, will be the principal speakers at the dedication of a monument at the site of the Oesterlen discovery well.

The celebration starts on Sunday, June 20, with special homecoming services in local churches, a drum and bugle corps exhibition featuring only crack, prize-winning organizations, and a song festival at Donnell Stadium, one of the finest structures of its character in the state.

Monday, June 21, there will be dedicatory services at the sites of the Oesterlen and Karg wells, the first and largest gas wells, luncheon for visiting celebrities, which will include Gov. Martin L. Davey of Ohio, and nationally known oil and gas company executives. In the evening a pageant, employing 1,000 actors and depicting the history of the oil and gas development in northern Ohio, will be staged.

Tuesday will start with a Pet and Juvenile Float Parade with over 1,000 youngsters in line. The evening feature will be a grand ball. O. D. Donnell's Annual Golf Party will also be held on this day, bringing into the city several hundred nationally known railroad, gas and oil company and industrial executives.

On June 23 an air circus will feature Lieut. Joe Mackey and a galaxy of the finest stunt flyers in the country. An Old Timer's Banquet will be held in the evening.

On Thursday there will be a Water Sports Carnival at the Riverside Swimming Pool. On Friday there will be an Oil Well Workers of Northwestern Ohio Picnic with an expected attendance of 5,000, with a program of oil field sports, including a pulling machine raising contest, pipe cutting and threading contest, rod wrenching contest, etc. In the evening a Flower Show will be held at Hospitality Hall.

The celebration will close on Saturday, June 26, with a grand parade that promises to be the largest ever held in northern Ohio.

A Hall of Hospitality will be provided for the comfort of the thousands expected to attend, and a housing committee is supplementing hotel accommodations.

Thousands of former Findlay residents have signified their intention of returning for the week, and 30 committees are working to insure them a hearty welcome, a widely diversified program of entertainment and genuine hospitality.

Harry Botsford of Titusville, Pa., active in the management of the Diamond Jubilee of Oil in Titusville in 1934, is acting as manager of the Golden Celebration.

Retail Gasoline Price Higher

The average retail price of regular or middle-octane gasoline continued to increase during May and on June 1 was 14.57 cents per gallon, or .02 cent higher than on May 1. This average, based on dealer prices in 50 cities throughout the United States or in some instances on the actual pump price by company-owned stations, is exclusive of all federal, state and municipal taxes. On January 1, 1937, the average price was 14.09 cents per gallon. The price since then has shown a steady increase until the present price is the highest recorded at any time since March 1, 1931, and .26 cent higher than the average of a year ago.

Oil News from Foreign Lands

Mexican Strike

The long threatened general petroleum strike in Mexico became reality May 28 reducing to idleness 17,000 workers engaged in producing, transporting and refining approximately 4,000,000 bbls. of crude per month.

Due to the dependence of numerous Mexican industries on continual supply of petroleum, some hope was held that President Lazaro Cardenas would step into the breach. Only 32 out of 262 points of contention were settled in 120 days of negotiations.

A final effort to avoid the strike was made by companies who offered wage increases totaling $2,000,000 annually with a minimum of 4.30 pesos per day. The workers sought a minimum of 6 pesos with numerous other demands. The companies say that with other concessions they were willing to grant the workers would receive a minimum of 8 pesos.

The workers claim wages equivalent to those in the United States. The companies reply they are paying double the wages in any other Mexican industry and taking into account living cost, Mexican oil wages are higher than in the United States.

Railroad and airline storage is said to have only sufficient material for a few days. Inconvenience to motorists on the main traveled highways was already apparent. Restriction was more acute in interior ports where transportation is almost completely dependent on automobiles and trucks.

Among the companies affected are Royal Dutch Shell subsidiary, Mexican Eagle; Standard Oil Co. of New Jersey subsidiary, Huasteca Petroleum Co.; Standard Oil Co. of California, Sinclair, and Cities Service.

Austria Needs More Oil

Crude oil production in Austria during 1937 probably will average around 1,400 bbls. per day, 500,000 bbls. for the year, but only about 20 per cent of the present domestic consumption. Despite sustained production from a well in Austria which initially produced 3,500 bbls. daily from about 2,550 feet, the country remains firmly on the importing side of the ledger. Further efforts, however, are under way to complete additional prolific wells in the Vienna Basin field in the lower part of Austria, where the 3,500-bbl. producer was completed near the end of 1936. Other wells previously completed in the same district have produced only small amounts of oil, but increased yield has followed each succeeding effort, indicating that full potentialities may not have been reached yet.

Crude production in the Vienna Basin was discovered in 1930, but the initial well was abandoned after yielding only a small amount of oil due to mechanical difficulties. The next well completed in 1932 produced at the rate of 7 bbls. daily with a few interruptions until 1936 when it was abandoned. Production of 35 bbls. daily until yield totaled 70,000 bbls. was obtained from the next well.

In June, 1936, No. 4 Gosting gave indications of substantial production and flowed 560 bbls. daily from around 3,600 feet. Two other producing wells were completed in the latter part of 1936, with output of 3,500 bbls. daily climaxing the campaign from No. 7 Gosting. The No. 7 Gosting remains today one of the largest producers in the central part of Europe and will unquestionably lead to further exploration throughout 1937. Erdolproduktions-Gesellschaft, owner of the No. 7 Gosting, is one of the most active concerns in exploration for additional Austrian production.

Since 1932, Austrian production has increased rapidly, but in 1933 it still represented only 5 per cent of the domestic consumption requirements, and growing demand has forced increases in imports. Austria's oil supplies for the past five years have come from the following sources:

	Domestic production	Imports
1932	840	1,790,000
1933	5,992	2,272,000
1934	29,253	2,162,125
1935	46,312	2,555,000
1936	61,061	2,730,000

The country's five principal oil refineries have combined capacity of 2,450,000 bbls. per year, listed as follows:

Company and location—	Capacity
Vacuum Oil Co., A.G., Kagran	770,000
Shell-Floridsdorfer Mineralol-Fabrik, A.G. Floridsdorf	770,000
Oesterreichische Fanto, A.G., Vosendorf	140,000
"Nova" Oel & Brennstoff Gesellschaft (under lease to Creditul Minier), Drosing	420,000
Korneuburger Mineralol Raffinerie, A.G. (under lease to Creditul Minier), Korneuburg	350,000

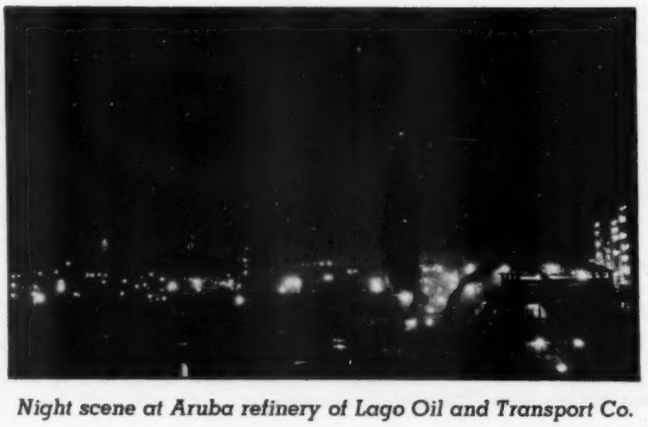
Principal products consumed in Austria during the past three years are shown below (figures in barrels):

	1934	1935	1936
Gasoline production	682,873	657,254	658,750
Gasoline imports	409,564	518,194	499,460
Total consumption	1,092,437	1,175,448	1,158,210
Kerosene production	279,566	277,287	279,000
Kerosene imports	99,301	165,695	160,502
Total kerosene	378,867	442,982	439,502
Gas oil production	129,964	75,748	76,125
Gas oil imports	186,035	225,098	260,130
Total gas oil	315,999	300,846	336,255

Under a cartel agreement which continues in effect to the end of April, 1938, sales quotas are assigned on gasoline, kerosene and gas oil with a result that price fluctuations are at a minimum. There is no indication that the government is considering nationalization of the petroleum industry, but on the other hand, offers all encouragement possible to private industry in development of petroleum.

Argentine Royalty in Oil

In an effort to increase the supply of crude oil available to the government-owned petroleum company in Argentina, the government has ruled that private producers may in the future pay their royalties in oil rather than in cash. Argentina's royalty from state-owned producing properties ranges from a minimum of 8 per cent to a maximum of 12 per cent, depending upon the locality of production, transportation facilities and other special considerations.



Night scene at Aruba refinery of Lago Oil and Transport Co.

Ecuador Oil to Japan

Nearly 60 per cent of Ecuador's crude oil exports are now going to Japan for processing by Chosen Oil Co., and later supplied to the Chosen (Korea) market to the gradual restriction of foreign companies.

During January, 1937, 82,103 bbls. of crude were shipped from Ecuador to Japan. Ecuador's production for January by the eight operating companies amounted to 180,058 bbls., compared to 148,981 bbls. for the same month in 1936 and against 175,918 bbls. in December, 1936. Out of the 180,058 bbls. of production in January, 1937, Anglo Ecuadorian Oilfields, Ltd., produced 172,638 bbls., reports the Bureau of Mines. During January, Ecuadorian refinery production totaled 37,682 bbls., consisting largely of residual fuel oil, gasoline and kerosene.

In addition to crude oil shipments to Japan, Ecuador exported 66,220 bbls. to Uruguay.

Increased receipts of crude oil from Ecuador at the Chosen Oil Co.'s Genzan refinery are reported for February and March, although details are not yet available.

The increasing volume of Chosen Oil Co. operations, which now include all interests previously managed by competitive Japanese companies, constitutes a serious menace to foreign concerns. For the first half of 1937, the Chosen government general has assigned petroleum sales quotas of 695,047 bbls. to Japanese firms and only 350,982 bbls. to foreign companies. Recent reports indicate that the Chosen government is considering establishment of a protected company to take over all local petroleum sales, probably indicating a further restriction of the activities permitted the three large foreign companies engaged in distribution.

Sales allotments for the first half of 1937 in Chosen:

Products—	Japanese firms (bbls.)	Foreign firms (bbls.)
Gasoline	210,715	96,026
Kerosene	127,689	122,026
Light oil	73,593	629
Lubricating oil	102,527	629
Heavy oil	180,523	130,832
Totals	695,047	350,982

Sales allotments for the first half of 1937 indicate that considerably more of the market will be supplied from the Chosen refineries when compared with import statistics for 1936. Imports for 1936, compared to 1935, are shown in the following table:

Products—	1936	1935
Crude oil	1,594,000	823,000
Gasoline	511,000	535,000
Kerosene	284,000	294,000
Gas oil	148,000	151,000
Lubricating oil	130,000	144,000
Other products	639,000	537,000
Totals	3,326,000	2,484,000

Soviet Below Plan

Soviet oil trusts are facing a difficult problem of recuperating from curtailed production during the first quarter of 1937. Severe winter storms in January and February retarded field operations to the extent that first quarter production this year is nearly 7 per cent below the first quarter of 1936.

The U.S.S.R. program for 1937 calls for production of 241,500,000 bbls. of crude oil (including oil equivalent to natural gasoline recovery), but during the first quarter the results were more than 5 per cent behind. The plan called for production of 24.7 per cent of the year's total during the first three months, or 59,650,000 bbls., whereas the actual yield was approximately 47,092,500 bbls.

Apparent inability of new drilling to keep output abreast of normal declines is noted. There appear to have been no favorable results so far from the determination late in 1936 to revive hundreds of wells which had passed the stage of natural production and which are still waiting for pumping equipment.

SAFE

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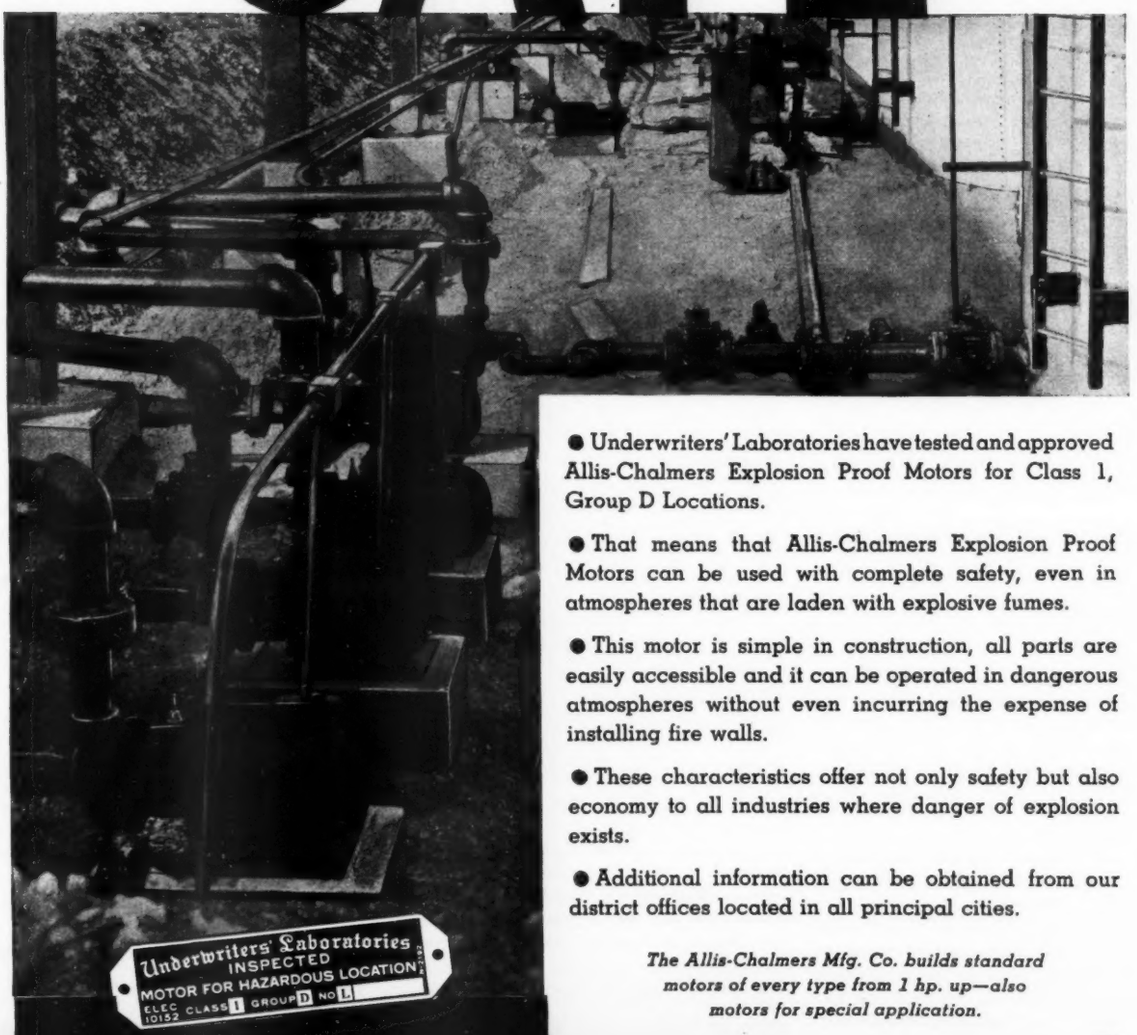

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MOTOR DIVISION

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Cause and Cure of Frozen Drill Pipe and Casing

By J. T. HAYWARD
Barnsdall Oil Co., Tulsa, Okla.

One of the most serious accidents that can happen to a well is the sticking of casing, drill pipe, or tubing. Very little has been published regarding the cause and prevention of these accidents, and even less about overcoming them when they have occurred.

The writer believes that much is to be learned both regarding prevention and cure, and in this paper attempts a beginning of this task. During the last several months scraps of information and case histories have been collected as they came to hand. It is realized that the value of the material here presented varies widely, and it has been difficult to arrange in a coherent manner.

When a string of drill pipe sticks, the usual thing is to start pulling and slacking off—although these operations are seldom successful. In territories such as Oklahoma City, oil spotting offers a good chance of success, but even on this there is no general agreement regarding the best method of procedure. Should the pipe be held in tension, or should it be alternately pulled and slacked off? What is the best oil to use? How much should be used?

***A.P.I.*—Presented before the mid-year meeting, June 1 to 3, Colorado Springs, Colorado**

The problem may be attacked along two principal lines: 1, research with small-scale apparatus in laboratories; 2, the recording and studying of actual field case histories.

Regarding the latter, the Institute's Topical Committee on Drilling Practice recently circulated a questionnaire regarding causes and cures of stuck pipe. A few replies have already been received, and contain a great deal of valuable information indicating great interest in the matter under discussion. Although this is far too extensive for inclusion here, a few quotations are given where they help the discussion.

The selection of the quotations used was made by the writer of this paper, and covers but a very small fraction of the valuable information contained in the replies.[1] The opinions expressed in connection with them are also personal, and do not necessarily represent the majority opinion contained in the replies.

A short while ago a liner and screen were being set in a Gulf Coast well. The back of the screen and the face of the sand were being washed by pumping water down the tubing and up behind the screen, which was suspended from the tubing preparatory to setting the packer. Just about the time that it was decided to set the packer, the liner was found to be stuck; and, as the screen was 10 ft. off bottom, it was too high up to make the completion. Alternate pulling and slacking off were resorted to without success. The pumps, which were already compounded, were speeded up, as circulation had not been altogether lost—and this also was unsuccessful. When there appeared to be no prospect of freeing the liner, it was decided to turn loose from it, mud the hole, and extract the tubing in order to go back in with the drill pipe to cut and fish out the liner. To change the pumps over to mud required their being shut down for a few minutes and, fortunately, but accidentally, they were stopped before turning loose from the liner. At this time there was a tension in the tubing somewhat greater than the total weight of the tubing and liner; and 30 sec. after stopping the pumps, the liner freed itself—the weight indicator dropping to the reading that corresponded to the weight of the tubing and liner. The liner was lowered into place, and the well completed without further difficulty.

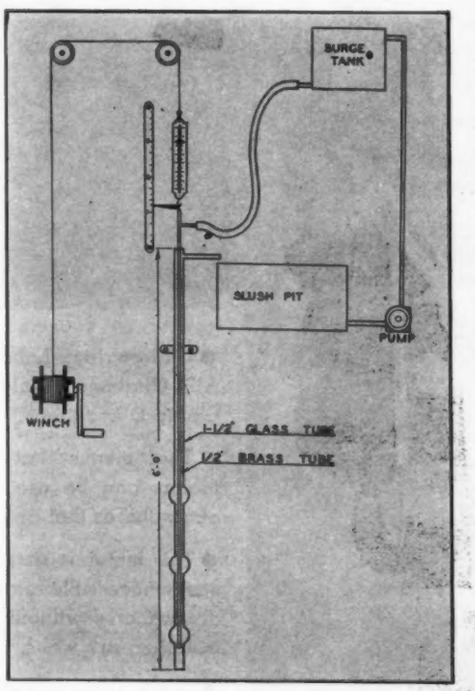


Fig. 1

The writer wondered at the time whether the freeing of this liner when it did was a case of coincidence, or whether shutting off the circulation and relieving the pressure was—although unpremeditated—the right thing to do under the circumstances. Inquiries made during the next few days elicited information regarding certain similar cases; for instance, a driller remembered a 7,000-ft. string of drill pipe that became stuck while preparations were being made to cement. It could not be freed by pulling; circulation became more and more difficult, until finally the hose blew off, after which the pipe freed itself in between 1 and 2 min.

An inquiry was addressed to a number of drilling superintendents and contractors. One of the questions asked was: "do you know of any case where the pipe, having stuck, stopping circulation freed it?" To this G. Elias[2] replied:

"We know of one case where drill pipe was stuck; and, although circulation was comparatively free, yet as soon as circulation was stopped and the drain on the pump delivery opened, letting off pressure freed the string.

"A few days ago we had a special case where,

[1]Many further replies containing valuable information have been received since this paper was compiled.

[2]G. Elias, general superintendent, Phoenix Oil and Transport Co., Ploesti, Roumania.

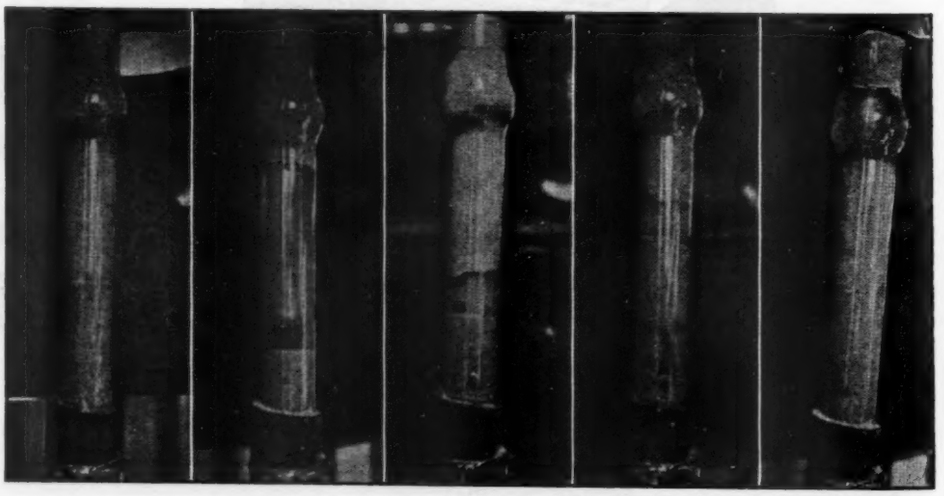


Fig. 2

on completing the running in of a new bit, the driller—apparently through carelessness—did not know that he was near bottom, and let the bit drop heavily on bottom. The bit entered the formation, stopping up the circulation holes. Circulation could, therefore, not be obtained, and the drill pipe was found to be stuck hard. After trying for some time to get circulation and at the same time to free the drill pipe by moving it, we bled the pressure off, and immediately the string was freed. We have frequently had cases where, on running the bit to bottom after changing, we found it difficult to start up circulation and, on getting circulation with difficulty, the drill pipe became sticky.

"Under such circumstances we have found on some occasions that on stopping the circulation

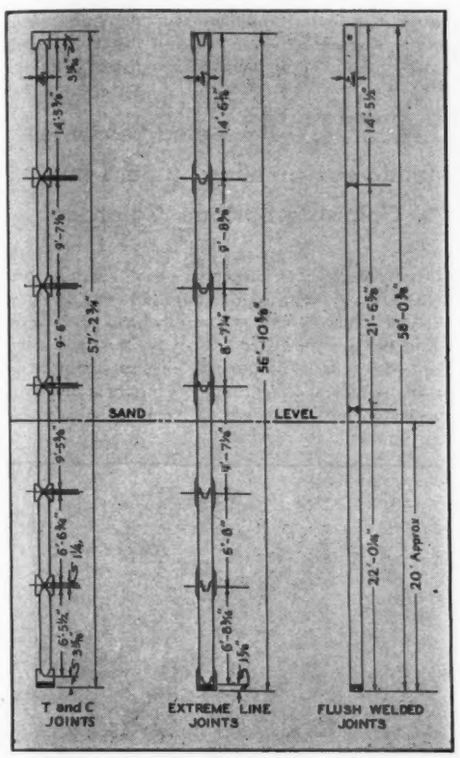


Fig. 3—Joint arrangement of 4¾-inch frozen casing as set in the 9⅝-inch casing

the drill pipe will become free; however, the risk of losing circulation is so great that we usually attempt to keep it at all costs, as it would give us a bad job if we stopped and thereby lost circulation without freeing the bit."

T. E. Stickle[2] also wrote saying that it was by no means uncommon for stuck pipe to come free upon stopping circulation.

This matter appeared to offer a promising direction for small-scale experiments. It was hoped that the conditions could be duplicated and the cause of the behavior found.

The apparatus shown in Fig. 1 was set up. A 6-ft. length of 2-in. inside-diameter glass tubing was clamped to the wall, and represented the hole. Bulbs were blown in the tubing to represent caves in the hole. The drill pipe, or casing, consisted of a 7-ft. length of ½-in. tubing (⅞-in. outside diameter). This drill pipe could be raised and lowered with a small hand winch—the pull being read on a spring balance, and the movement or creep measured by a pointer attached to the drill pipe and traveling in front of a vertical scale. As will be seen in Fig. 1, means for causing and maintaining circulation were provided.

[2]T. E. Stickle, drilling superintendent, J. E. Mabee Interests, Tulsa, Okla.

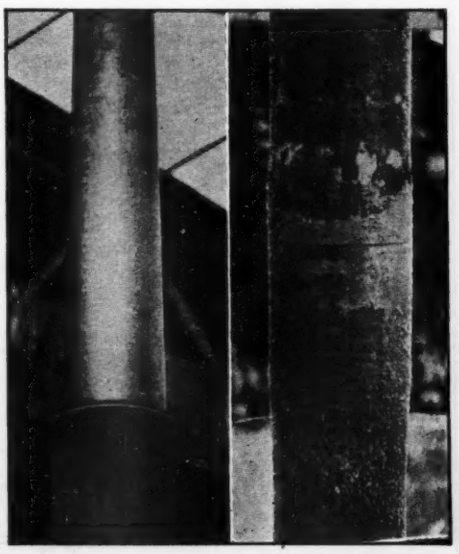
When the pipe is stuck, the force holding it may be looked upon as an interfacial shear acting between the surface of the pipe and the material that is in contact with and gripping it. Knowing the length of the pipe gripped, the interfacial shear can be calculated as follows:

Let D = outside diameter of pipe, sq. in.
L = length gripped, in.
p = the effective pull, lb.
S = the interfacial shear, lb. per sq. in.

$$\textit{Then } S = \frac{P}{\pi DL} \text{ lb. per sq. in.}$$

With this apparatus attempts were made to simulate the conditions on the Gulf Coast well mentioned in a previous paragraph, and it was soon found that the freeing of the liner upon stopping circulation was not a coincidence. The glass tubing was filled to a height of 4 ft. with river sand, and the tubing, which was plain and without any collars, circulated down to 6 in. off bottom through the sand. By reducing the rate of circulation, it was possible to stick the pipe, and steady pulls for extended periods or alternately pulling and slacking off would not free it. Shutting off circulation under these conditions completely freed the pipe in periods varying from 30 sec. to 3 min. in 75 per cent of the trials. In the other 25 per cent re-starting the circulation for a few moments and then again stopping it freed the pipe.

The tubing being of glass, it was possible to observe what was happening in it. At low rates of circulation and at some point in the hole where there is a change in cross-sectional area such as at one of the bulbs—which, of course, corresponds to a cave in a real well—the rate of upward circulation of the fluid becomes too slow to carry the larger particles, and they begin to collect in the enlargement and form a loosely-compacted bridge. This bridge then acts as a screen, and grains are slowly added to the lower end. The length of this bridge constantly grows in a downward direction. Circulation apparently takes place through fine channels; and, as the bridge grows in length, it becomes more and more effective as a filter bed—new material constantly being added to and held on the lower end by the upward pressure of the fluid. Upon cutting off circulation, the lower end of the bridge slowly melts away as the particles previously held in place by the pressure fall downward through the fluid. This melting away continues until the bridge has been completely eaten away and the pipe is freed.



Figs. 5 and 6

Fig. 2 shows photographically the formation and decay of a bridge as described above. When the first three pictures were taken, circulation was

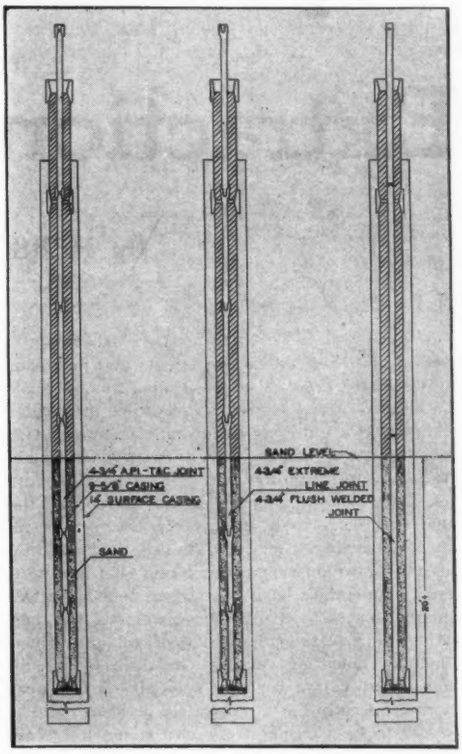


Fig. 4—4¾-inch casing joints as frozen in sand

on, the upper bridge growing downward, sand grains being constantly carried from below and added to its lower surface. The last two pictures show the reverse process, circulation having been shut off and the bridge decaying as the material drops from its lower face.

With this model it easily can be seen that bridges may form in the annular space in two different manners. If circulation is stopped, solids fall through the fluid, and bridge builds upward. If circulation is on, the solids are carried up to some obstruction, and the bridge grows downward. In a few cases decay of the bridge after circulation had been stopped would not be complete, the lower face of the bridge being sufficiently compacted to stand up. In such cases decay of the bridge could always be re-started by stopping and starting circulation a few times.

It appears, therefore, when pipe has stuck but circulation has not been lost, that one of the first remedial steps to be taken would be to shut down the pumps and relieve the pressure. If after 5 to 10 min. this is not successful, alternate stopping and starting the pumps should be tried.

Many additional tests have been carried out with the model already described.

The hole was filled to a height of 4 ft. with river sand, screened through 10- and retained on a 40-mesh screen. The pipe was circulated down through the sand until it was a couple of inches off bottom. Circulation was then stopped, and the pipe allowed to stand 10 min.—after which it was found to be perfectly free. The experiment was repeated, the period during which the pipe was allowed to stand being increased up to 24 hours without the pipe's freezing. During these tests, although it was found that the pipe would not freeze if left undisturbed, it would immediately stick if given a few light taps with a pencil and, that once stuck in this manner, it could not be

(Continued on Page 131)

Experimental Solvent Extraction Tower Unit

By HERSCHEL G. SMITH
Gulf Oil Corp., Pittsburgh, Pa.

For our earlier experimental studies of solvent-extraction agents and processes we employed a series of glass separatory funnels maintained at the desired temperature in a water bath, working out a cycle of usually six stages with the separated extract layer from one funnel drained intermittently into the succeeding funnel. This system and variations thereof at the time had been used extensively by various refinery laboratories on such studies. Semi-continuous or continuous apparatus along this line with fixed connections also had been developed. Although this method proved satisfactory for indicating the yields and quality of solvent-refined oils and indicating roughly the desirable conditions of operation for any solvents or mixtures thereof operating at atmospheric pressure, still it proved to be a cumbersome and somewhat time-consuming one — particularly when appreciable volumes of oils were desired for study, and when it was desired to study a wide range of operating conditions, two requirements for more advanced study of solvent-extraction methods.

Continuous Apparatus

Our next step along this line was, therefore, to assemble a small continuous, glass, solvent-extraction tower of 1⅛ in. inside diameter, 5 ft. high, with jacket for temperature control and the use of short sections of glass tubing as packing for securing contact. With proper arrangement of continuous charging pumps and flow regulation, we secured apparatus that was superior to any we had previously employed, as to both accuracy and volume of experimental oil available for study. The capacity of this small tower was limited to an oil charge of around 0.5 gal. per hour, and I concluded that it would be advisable to extend this system to a larger tower with greater refinements in control of volumes, temperatures, and other conditions, so that more exact study of the matter could be made. Based on our experience with this smaller preliminary tower, we then designed and installed a glass tower of 15-ft. over-all height. The problems of high cost for a straight glass tower, structural complications, breakage hazards, difficulty or impossibility of securing very long glass tubing of this size, or of welding shorter lengths of tubing, led me to conclude that it would not be feasible to develop such a tower in one section; therefore, we designed and built one having more novel and satisfactory structural and design features, of reasonably low cost, and providing full control of all of the operating variables for which study was desired, with automatically-regulated overflow control, that has been very helpful in our studies. This tower was designed so that regular 5-ft. lengths of standard pyrex tubing could be used for three flanged sections, both for the tower proper and outer tubes 56 in. long for the jacket, with compression joints so that liquid-tight joints were secured at the ends of the glass tubes by pulling up on threaded-through rods. The flanges were so designed as to accommodate stuffing boxes to provide liquid-tight joints for the outside glass jackets independent of the inside glass tubing; so that, if any leak should occur in the circulating fluid employed for temperature control of various sections of the tower, it could not possibly find its way into the oil and solvent inside the tower proper, but would merely show as an outside leak. The larger tower of improved design has been in successful use in our experimental studies of solvent refining at atmospheric pressure for two years, with a duplicate now operating successfully as a check on large-scale operation in one of our refinery laboratories.

Design Details

Fig. 1 gives a semi-detailed elevation drawing of the outfit, along with individual sketches of details of each of the three joints of the installation. Fig. 2 is a photograph showing one of our installations of this design.

The tower proper consists of three sections of 1 1/8-in. inside-diameter x 2-in. outside-diameter x 5-ft. long standard pyrex glass tubing, each separate section being surrounded by a jacket section of 2¾-in. inside-diameter x 3-in. outside-diameter x 4-ft. 8-in. long standard pyrex tubing. For temperature adjustment and control, water is circulated in the jacket when the desired extraction temperatures are below the boiling point of water, oil is used when higher temperatures are required.

The end of each section of tubing of the tower and jacket was ground to exact fit for assuring tight compression joints, each joint being similar to an ammonia flange joint. DuPrene rubber packing has been found most satisfactory, being affected but little by oil or solvent. In order to avoid strains and breakage, it was found advisable to build a vertical chassis or rack on which the tower could be assembled, as shown by the side elevation, Fig. 1, each of the pair of supporting arms at each intermediate flange being held up by a special spring, each pair of springs so adjusted

***A.P.I.*—Presented before the mid-year meeting, June 1 to 3, Colorado Springs, Colorado**

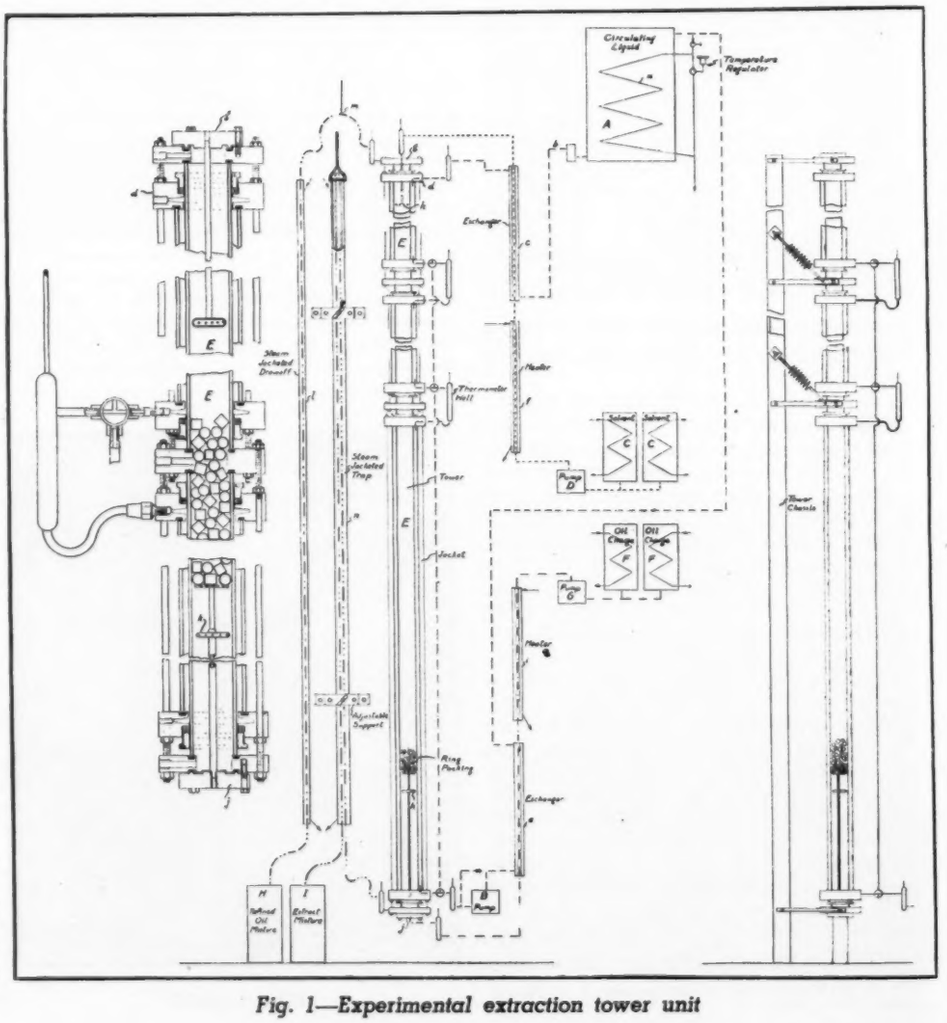


Fig. 1—Experimental extraction tower unit

as to have sufficient tension to support just about one-third the total weight of the tower. With the two pairs of spring hangers and a direct bottom support from the floor, and with the provision of

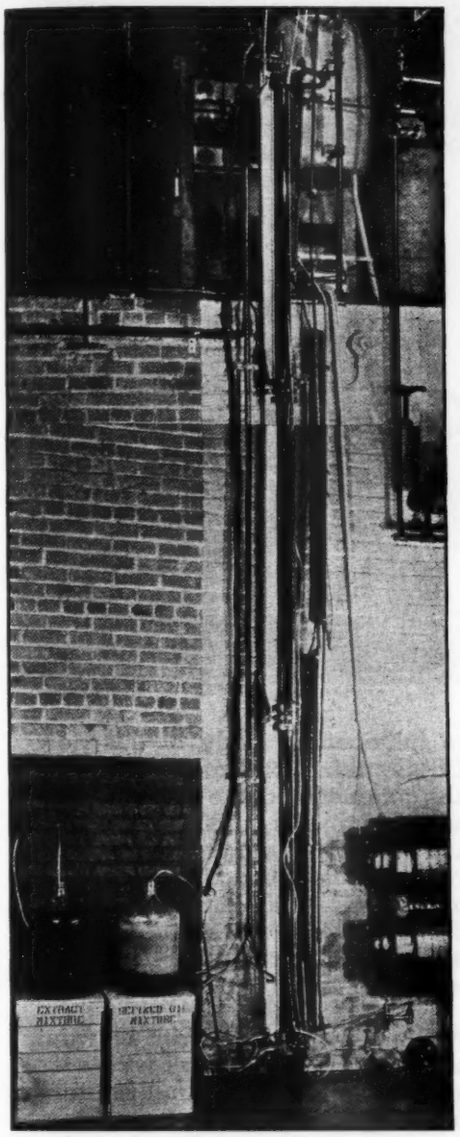


Fig. 2—Extraction tower unit

ample clearances and soft DuPrene packing in the flange joints, so that glass does not touch a metal flange at any point, no serious breakage trouble has been encountered. For the jackets for tower temperature control, each of the three sections is supplied with a three-way valve and thermometer well.

The temperature of liquid for temperature control can be read at an outlet in each section, and any jacket can be partly or wholly by-passed in case it is desired to study the effect of greater temperature variations than would be encountered by straight liquid circulation through the three sections in series. The lines for charging and for drawing out the refined oil and extract mixtures are also provided with thermometer wells for temperature observation—each of these wells merely consisting of a section of brass pipe slightly larger than the line proper so as to accommodate an enclosed well. The brass flanges are drilled at the necessary points with L-holes, and tapped to accommodate the connecting pipes so as to provide all desired connections for the tower proper and the jackets; thus no welding of connection to glass tubing is required at any point.

The extract layer from the tower is drawn out through a ∩-trap with top vent, the elevation of which is made adjustable by clamp support, this trap being connected with the bottom of the tower by flexible tubing. Steam heating of this at a constant temperature serves the dual purpose of keeping the material in liquid form when high-solidifying-point oils and/or solvents are being employed and of assuring a constant temperature for gravity control of flow. For normal operation of the tower under the best conditions there is a level at which, within a very short distance, the direction of flow of the liquids appears actually to reverse itself, due to change in phase: below this level the upwardly-rising oil droplets are visible as the moving material; above, the downwardly-moving droplets of mixture of solvent and extracted material. Thus the flow appears to be taking place in two directions in the tower at the same time, above and below this level. By adjusting the ∩-outlet by movable clamp, without any flow control valves, we are able to apply rather exact differential means for maintaining the desired level for the place trading effect noted above, so that a change of an inch or two in the height of the ∩-outlet trap will effect a change of 6 in. or more in the height of the level of the apparent flow direction change in the tower. The preferable operating level for this point has been determined by trial to be about 30 in. from the bottom of this tower.

All inlet and outlet charging lines are provided with steam jackets or double pipe exchangers, or by insulated wrapped-copper steam coils where flexibility of connections is required.

Operating Details

The starting up and operating procedure for this tower may be outlined as follows:

Temperature controlling liquid in tank *A* is heated with the closed steam coil *a*, maintained at about the temperature at which it is desired to operate the tower by means of a thermostatically-operated solenoid and butterfly valve which serves to admit or by-pass steam for the heating coil as required. Pump *B* is started so that there is circulation of the fluid in the jackets of the three sections of the tower, as desired, this fluid passing through line *b*, exchanger *c*, through connection in flange *d* at the top of the upper section of the tower, downward through the jacket sections, which are joined by U-connections as shown. The fluid passes from the tower jacket to pump *B* and returns through small tube exchanger *e* to the temperature controlled reservoir *A*. The rate of flow can be varied by providing a by-pass regulating valve on pump *B*, so as to secure a moderate temperature drop between the bottom and top sections, when this condition is desired.

Solvent from either of the two charging tanks *C*, each provided with a steam-heating coil, is forced by pump *D* through double-pipe steam heater *f* and exchanger *c* into the top flange *g* of extraction tower *E*, thence into tower through the circular perforated distributor *h*, located 18 in. below flange *g*, until the tower is about one-third full of solvent then the oil charge from either of tanks *F*, which are provided with closed steam-heating coils, is pumped by pump *G* through steam heater *i* and exchanger e, through the connection on the bottom of flange *j* of the tower, and into the tower through the circular perforated distributor *k*, located 18 in. above flange *j*. This oil then rises through the solvent, as accumulated in the tower. The pumping of both the solvent and of the oil charge at the desired charging rates for each is then continued until the tower is filled and equilibrium attained. After proper adjustment of the perferred level of change of apparent direction of flow in the tower has been secured, as discussed above, the operation is continued for as long as desired, the refined-oil mixture flowing from the top of the tower through steam-heated line *l* into running tank *H*; the extract mixture flowing through trap *n* to running tank *I*.

A very satisfactory type of charging pump for this work is the Hills-McCanna motor-driven type L-4 proportioning pump. Fig. 3 is an illustration of the layout of charging tanks and pumps. With these adjustable proportioning pumps on the charge and solvent, and the arrangement as described for trap control of the outlet, no valve, other than the check valves of the pumps, is required for the entire outfit for full control of the flow of charge, solvent, refined-oil mixture, or levels in the tower, as there is a balance in pressures of the liquid columns: the specific gravity of the extract mixture in the ∩-trap times the total height of it equals the over-all specific gravity of the liquids in the extraction tower times the height to the highest point of the outlet at *m*. The two mixtures flow automatically to the running tanks. This control is an important point for exact operation of this type of equipment, as attempts at regulation of flow with needle valves often give erratic results and poor control.

As a matter of convenience, the recovery of solvents from the refined oil and the extract mixtures is effected in separate laboratory vacuum stills.

Studies in cycle oil recovery from the extract mixtures can be carried out most conveniently by operation at desired temperature conditions in the tower and the later placing of bottles of the extract mixtures in temperature-controlled ovens or water baths at various temperatures, the separated oils from the mixtures with these varying conditions being measured, recovered, and inspected.

Typical Operating Results

This outfit has been so designed that it can

(Continued on Page 134)

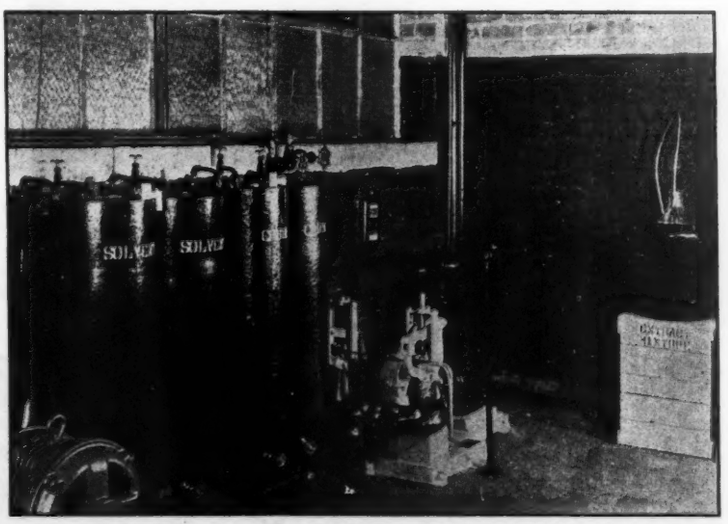
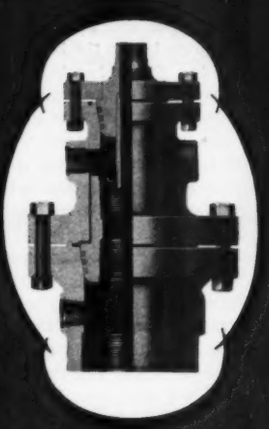


Fig. 3—Charging pumps and tanks



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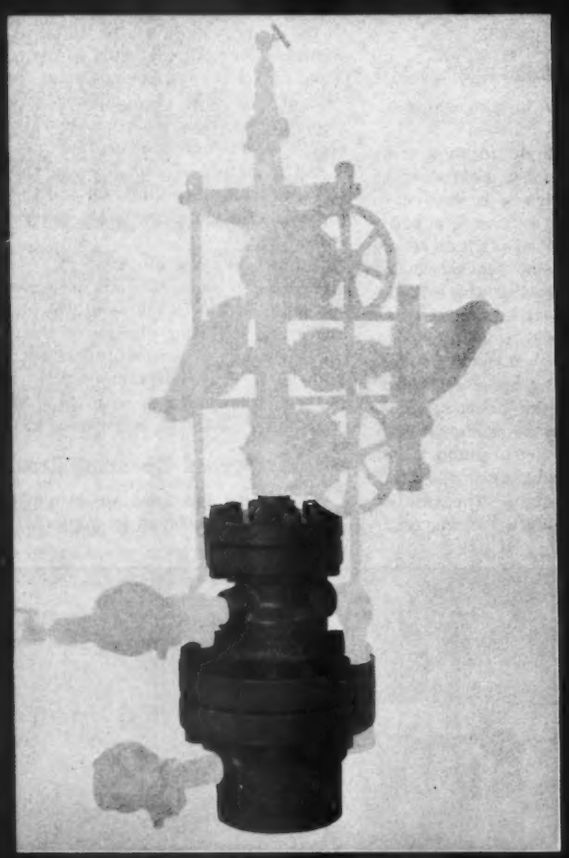

Completely assembled Christmas Trees, built to required specifications on the new "HZP" Combination Head, are now a regular part of the Dreadnaught line of oil field equipment.

DRILL 'EM The full-opening body of this new Dreadnaught "HZP" Combination Casing and Tubing Head permits the completion of the entire drilling operation through the head. It is a 3,000-lb. working pressure head, each assembly being tested to 6,000-lb. hydrostatic pressure. Standard ring joints are provided between its series 900, A.S.A. standard flanges. It is made entirely of alloy steel. Hangers are specially heat treated to produce a minimum tensile strength in excess of that of Grade "D" Casing.

CONTROL 'EM Designed for use with blowout preventer equipment, the "HZP" head provides for complete control of the well while drilling, running and landing casing, drilling in and running tubing. Blowout preventer equipment flanges directly to the head. Where tubing is run against pressure, the tubing head can be furnished with T-segment bolts to hold the tubing hanger in the body of the head after tubing has been landed. The well thus sealed in, blowout preventer equipment can be removed in absolute safety.

COMPLETE 'EM After blowout preventer equipment is removed, a split lap-joint ring bolts down over a lip on the tubing hanger, and the Christmas Tree is made up on top of the hanger. The "HZP" head is available with or without the complete Christmas Tree assembly, which is built to required specifications.

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High-Octane-Number Blending Stocks Produced by Solvent Extraction

By E. SAEGEBARTH, A. J. BROGGINI and E. STEFFEN
Edeleanu Co., Ltd.

The steady increase in comparison ratios of internal-combustion engines during the past 10 years, with the aim of improving efficiencies, has increased the demand for non-detonating fuels to such an extent that the refiner has had to turn to new methods for their production. Cracking and reforming have been generally accepted by the oil industry; and recently polymerization of gaseous olefins, with and without the use of catalysts, and the manufacture of *iso*octane and *iso*propylether have been introduced into the technique.

The purpose of this paper is to show how solvent-extraction methods can be used for the production of blending stocks of 80 to 100 octane number from straight-run naphthas of widely-different origin. In 1925, L. Edeleanu directed attention to the anti-knock properties of extracts obtainable by liquid-sulfur-dioxide extraction of naphthas and low-boiling kerosine cuts. His U. S. patents 1,585,473 and 1,661,566, granted in 1926 and 1928 respectively, suggest especially the use of extract fractions boiling between 270 and 430 deg. F. for blending with the lower-boiling fractions, thus eliminating the paraffins and naphthenes of high boiling range and very low octane number.

The demand for blending stocks of higher octane number made it necessary to improve upon the method of extraction by selecting treating conditions under which only the aromatic and unsaturated hydrocarbons would be removed, leaving undissolved as many as possible of the saturated constituents of the naphtha. This was accomplished by extracting the charging stocks at low temperatures ranging from 0 to —60 deg. F.

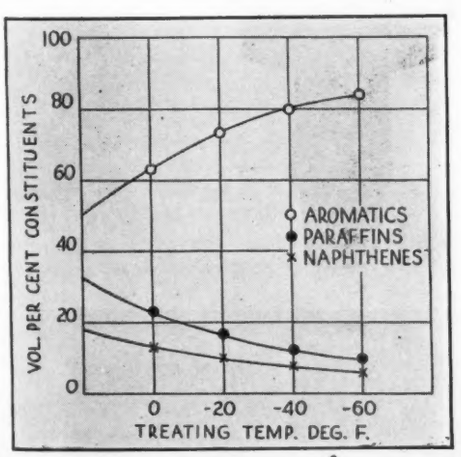

Fig. 1—Composition of extracts produced from Mid Continent naphtha at temperatures of from 0 to —60 deg. F.

Charging Stocks

The concentration of aromatics present in straight-run naphthas varies widely, depending upon their origin. In order to cover as wide a field as possible, we selected for these experiments a Mid Continent naphtha with 9.5 per cent aromatics, a Sumatra naphtha containing 19.8 per cent aromatics, and a South Texas stock with 31.2 per cent aromatics. These three samples comprise straight-run naphthas of about the lowest and highest aromatic content generally available.

A.P.I.—Presented before the mid-year meeting, June 1 to 3, Colorado Springs, Colorado

The suitability of the stocks for solvent extraction also depends on their boiling range. Since benzol (boiling point, 176 deg. F.) is the lowest-boiling aromatic compound, substantially all the aromatics will be concentrated in fractions with a true initial boiling point of 176 deg. F. Actual tests have shown that extracts produced from straight-run fractions having a boiling range from 100 to 400 deg. F., have ASTM initial boiling points of approximately 200 deg. F. This indicates that it is desirable to extract cuts with an initial ASTM boiling point of about 200 deg. F. in order to obtain maximum yields of blending stocks based on crude. This statement refers to straight-run gasolines only. In cracked naphthas, olefinic constituents of lower boiling points are present which it may be advisable to extract.

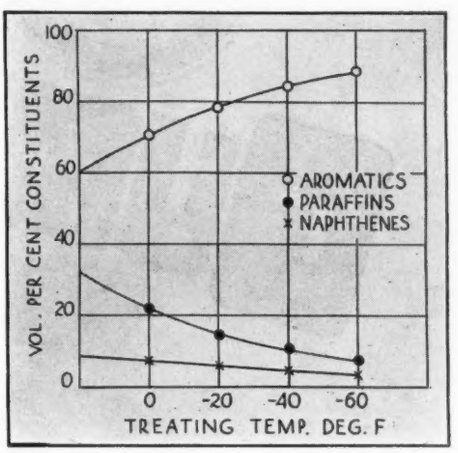

Fig. 2—Composition of extracts produced from South Texas naphtha at temperatures of from 0 to —60 deg. F.

The composition of the charging stocks, as well as that of raffinates and extracts, was determined by the Egloff analysis. Three volumes of 80 per cent sulfuric acid per volume of stock and re-running were used for the determination of the unsaturated hydrocarbons, and 98 per cent sulfuric acid in the same proportion for the aromatics. The percentages of naphthenes and paraffins were calculated from the aniline points of the acid-treated naphthas, using 70 deg. C. as the aniline point of pure normal paraffins.

The percentages of olefins present in the straight-run naphthas was found to be small, ranging from 1 to 2 per cent. For reasons of brevity, we refer in the following to "aromatics"; also in those cases in which the stocks actually contain a small amount of unsaturated hydrocarbons.

Treating Conditions

Mid Continent Naphtha—The results obtained with a straight-run Mid Continent naphtha, boiling between 225 and 400 deg. F., are shown in Table 1.

Forty per cent by volume of solvent was used at 0, —20, —40, and —60 deg. F., respectively. Since the charging stock contains only about 10 per cent aromatics and unsaturates, the yields of extracts are low—ranging from 12.5 to 9.1 per cent by volume. However, the aromatic content of these blending stocks is high, varying between 71 and 89 per cent by volume; consequently, they show high CFR

TABLE 1—EXTRACTION OF STRAIGHT-RUN MID CONTINENT NAPHTHA WITH SULFUR DIOXIDE

		Experiment No.:			
		1	2	3	4
Amount of sulfur dioxide used, per cent by volume		40	40	40	40
Extraction temperature, deg. F.		0	—20	—40	—60
	Charging Stock	High-Octane-Number Stocks			
Yields, per cent by volume	....	12 5	10 6	9 6	9 1
Gravity, deg. A.P.I.	53 1	36 7	34 7	33 5	32 2
Octane No., CFR method	below 41	82 6	86 2	89 0	91 0
Kauri gum No.	34 4	71 7	77 3	82 8	88 6
Unsaturates and aromatics, per cent by volume	9 5	70 7	78 6	84 3	89 1
Naphthenes, per cent by volume	15 6	7 3	5 9	4 8	3 4
Paraffins, per cent by volume	74 9	22 0	15 5	10 9	7 5
Sulfur, per cent by weight	0 03	....	....	....	0.10
ASTM Distillation, Deg. F.:					
Initial boiling point	225	243	251	251	255
10-per-cent point	256	271	276	275	279
50-per-cent point	301	309	313	313	314
90-per-cent point	359	362	362	361	364
End point	397	412	413	414	414

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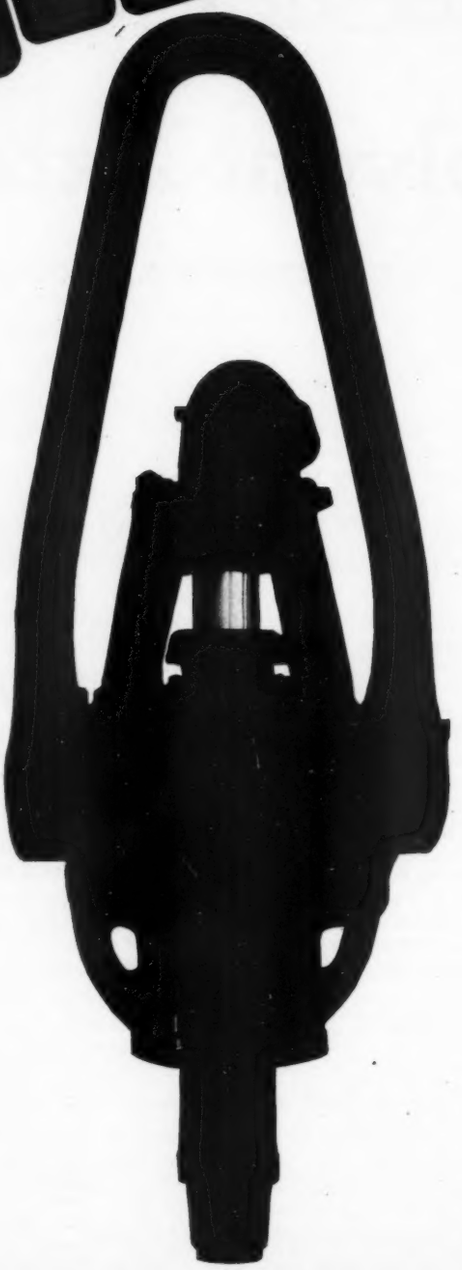

Built to carry the heavy loads and to withstand the terrific shocks encountered in the deepest drilling in any territory, the 300-ton GUMBO BUSTER ROTARY SWIVEL is the strongest, safest, and most efficient Swivel obtainable today.

It is 110-inches long overall, 38-inches wide; and weighs 5,100-pounds. Upper housing and lower housing are made of cast steel. The extra heavy bail, 5-inches in diameter by 65-inches long, is a one piece steel forging. Swivel Stem, Swivel Stem Coupling, Wash Pipe and Goose Neck are also all made from steel forgings. Wash Pipe opening is 4⅛-inches. Goose Neck opening is 5¾-inches. Main Thrust Bearing, Upper Thrust Bearing, Upper Radial Bearing, and Lower Radial Bearing are all heavy duty straight Roller type, operating in an oil bath. *The capacity at all points of stress in this Swivel is more than 300 tons.*

(Gumbo Buster Rotary Swivels are also made in three smaller sizes)

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octane numbers—from 82 to 91—and high Kauri gum numbers, from 72 to 88.

Sumatra Naphtha—Two treatments of a Sumatra naphtha are shown in Table 2.

This charging stock boils between 190 and 321 deg. F.; 55 per cent by volume of sulfur dioxide

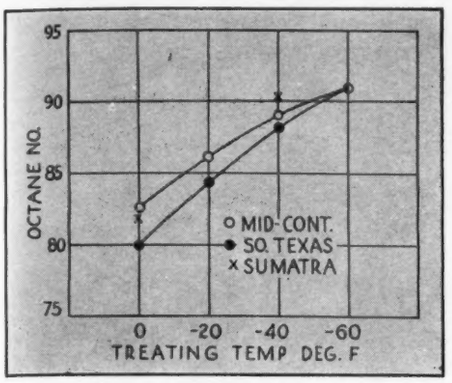

Fig. 3—Octane numbers (CFR method) vs. treating temperature

was used for the extraction at —40 deg. F., which yielded 22 per cent by volume of extract with 90 CFR octane number and 89 Kauri butanol number. In the extraction at 0 deg. F., 85 per cent of sulfur dioxide was employed on account of the larger amount of blending stock extractable at this temperature. The blending stock, amounting to 30 per cent by volume of the charging stock, shows

TABLE 2—EXTRACTION OF A STRAIGHT-RUN SUMATRA NAPHTHA WITH SULFUR DIOXIDE

		Experiment No.:	
		5	6
Amount of sulfur dioxide used, per cent by volume		85	55
Extraction temperature, deg. F.		0	—40
	Charging Stock	High-Octane-Number Stocks	
Yields, per cent by volume		30 0	22 0
Gravity, deg. A.P.I.	53 6	40 8	36 2
Octane No., CFR method	....	81 8	90 3
Kauri gum No.	....	75 8	88 9
Unsaturates and aromatics, per cent by volume	19 8	61 6	78 7
ASTM Distillation, Deg. F.:			
Initial boiling point	190	202	207
10-per-cent point	211	226	233
50-per-cent point	241	253	261
90-per-cent point	288	293	296
End point	321	318	324

an octane number of 82 and a Kauri butanol number of 75.8.

South Texas Naphtha—Tests on the South Texas straight-run naphtha were carried out with 70 per cent by volume of sulfur dioxide at 0, —20, —40, and —60 deg. F., and results were obtained as shown in Table 3 by experiments No. 7 to 10. Since

TABLE 3—EXTRACTION OF A STRAIGHT-RUN NAPHTHA FROM SOUTH TEXAS CRUDE WITH SULFUR DIOXIDE

		Experiment No.:				
		7	8	9	10	11
Amount of sulfur dioxide used, per cent by volume		70	70	70	70	70
Extraction temperature, deg. F.		0	—20	—40	—60	0 to —60
	Charging Stock	High-Octane-Number Stocks				
Yields, per cent by volume		46 5	39 5	35 9	34 0	34 0
Gravity, deg. A.P.I.	46 8	38 9	36 5	35 0	33 7	33 6
Octane No., CFR method	57 9	80 0	84 4	88 2	91 1	90 8
Kauri gum No.	46 1	68 8	77 2	81 0	82 4	82 4
Unsaturates and aromatics, per cent by volume	31 2	63 1	73 5	80 2	84 0	84 7
Naphthenes, per cent by volume	19 8	13 2	10 1	8 0	6 2	5 8
Paraffins, per cent by volume	49 0	23 7	16 4	11 8	9 8	9 5
Aniline point, deg. C.	....	—12 8	—17 7	—19 3	—19 3	—19 5
Sulfur, per cent by weight	below 0 01	<0 01	....	....	<0 01	<0 01
Freezing point, deg. F.	....	....	....	....	....	below —60
ASTM Distillation, Deg. F.:						
Initial boiling point	232	239	237	241	247	247
10-per-cent point	256	258	259	261	267	267
50-per-cent point	292	290	288	289	292	292
90-per-cent point	344	338	336	336	337	336
End point	382	398	390	390	394	391

TABLE 4—INSPECTION OF RAFFINATES PRODUCED BY EXTRACTING STRAIGHT-RUN NAPHTHAS WITH SULFUR DIOXIDE

	Mid Continent		Sumatra		South Texas	
Origin of naphtha						
Experiment No.	1	4	5	6	7	11
Extraction temperature, deg. F.	0	—60	0	—40	0	—60
	Raffinates Produced					
Yields, per cent by volume	87 5	90 9	70 0	78 0	53 5	66 0
Gravity, deg. A.P.I.	54 8	55 3	59 2	59 1	53 7	54 0
Octane No., CFR method	....	below 41	51 2	50	below 41	below 41
Kauri gum No.	....	....	36 0	35 5	32 7	32 4
Unsaturates and aromatics, per cent by volume	....	1 5	2 0	1 2	3 5	1 3
Naphthenes, per cent by volume	....	16 0	....	....	24 5	25 1
Paraffins, per cent by volume	....	82 5	....	....	72 0	73 6
ASTM Distillation, Deg. F.:						
Initial boiling point	....	223	....	190	....	236
10-per-cent point	....	255	....	211	....	259
50-per-cent point	....	303	....	240	....	298
90-per-cent point	....	362	....	292	....	350
End point	....	399	....	320	....	394

31 per cent by volume of aromatics is present in this charging stock, the yield of extracts is quite high—ranging from 46.5 per cent at 0 deg. F. to 34.0 per cent at —60 deg. F. CFR octane numbers range from 80 to 91, and Kauri gum numbers from 69 to 82. Aniline points of the extracts lie between —12.8 and —19.3 deg. C.

Attention is directed to experiment 11, in which a temperature gradient was employed in the extraction tower, holding 0 deg. F. in the upper part of the tower, —30 deg. F. in the middle, and —60 deg.

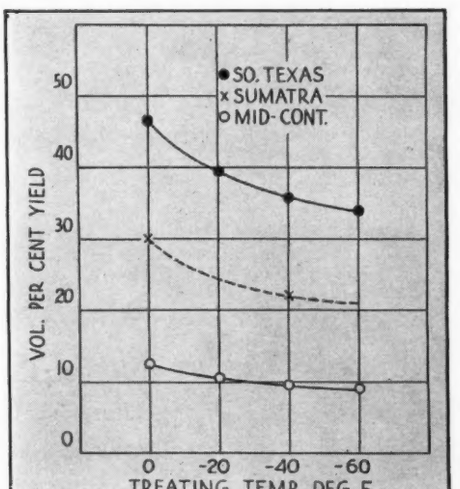

Fig. 4—Yields of extracts (blending stocks) vs. extraction temperature

F. at the bottom. Yields and specifications of the extracts obtained in experiments 10 and 11 are alike. The temperature-gradient treatment deserves preference due to savings in refrigeration, since the solvent has to be cooled only to 0 deg. F. instead of to —60 deg. F. as in the normal procedure.

The specifications of some of the raffinates are shown in Table 4. It is seen that the raffinates contain only about 1.5 per cent aromatics, with the exception of the raffinate from experiment 7, which shows 3.5 per cent aromatics. The reason for this is that the extraction at 0 deg. F. yielded a large percentage of extract, viz., 46.5 per cent of the charging stock, and, for optimum treating conditions, somewhat more than 70 per cent by volume of solvent should have been used. It is significant that the properties of the raffinates obtained at 0 deg. F. are almost exactly the same as those of the raffinates produced at —60 deg. F., which shows that liquid sulfur dioxide has sufficient solvent power even at this low temperature to dissolve all the aromatics from naphthas. Moreover, the raffinates contain very little sulfur. These characteristics make them suitable for use as cleaner's (Stoddard) solvents. The data shown in Table 4 allow the statement that the fraction boiling above 300 to 350 deg. F. may be blended into high-quality kerosine. The remaining lower-boiling fraction may be charged to a reforming unit.

Effect of Treating Temperature on Octane Numbers

The octane numbers were determined according to the CFR method with an intake temperature of 300 deg. F.

As is generally true with most selective solvents, the degree of selectivity is a function of the extraction temperature. Since the octane number of the extracts, or blending stocks, is directly upon their aromatic-hydrocarbon concentration, it is desirable to use the solvent at a temperature which yields the highest concentration of the hydrocarbons. Liquid sulfur dioxide will remove the aromatics from light petroleum distillates at any temperature at which phase separation will take place. However,

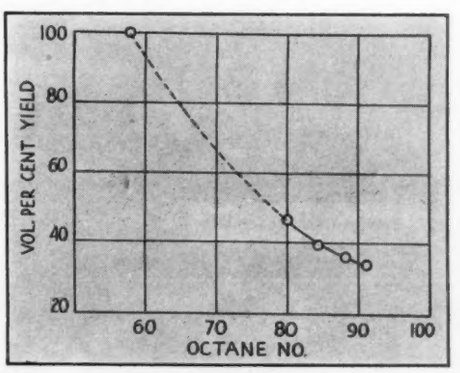

Fig. 5—Yields of blending stocks produced from South Texas naphtha vs. octane number

at temperatures in the neighborhood of +14 deg. F., or higher, a considerable amount of hydroaromatics (naphthenes) and paraffins is dissolved by the solvent, thereby appreciably reducing the octane number of the blending stocks. Fig. 1 and 2 show the trend of the concentration of aromatics, naph-

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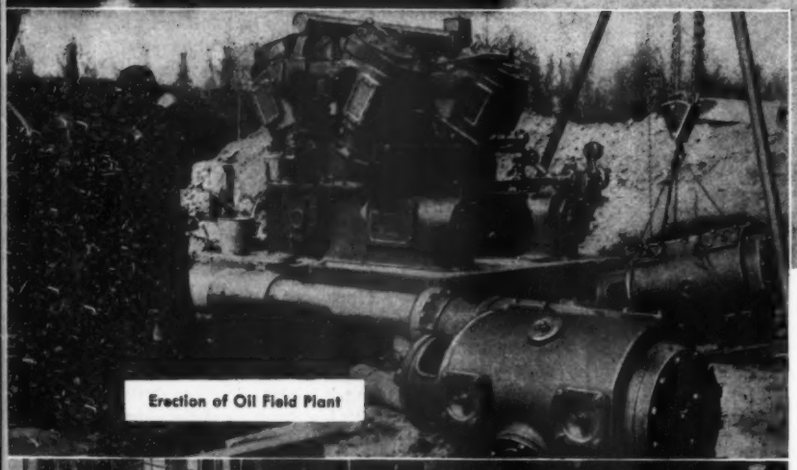

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thenes, and paraffins in the Mid Continent and South Texas extracts as the extraction temperature is decreased from 0 deg. F. to —60 deg. F.

Fig. 3 shows the effect of the extraction temperature of the octane number of the extracts produced from Mid Continent naphtha, Sumatra naphtha, and South Texas naphtha. In all cases extracts with octane numbers in the vicinity of 80 were obtained at 0 deg. F.; while octane numbers of about 90 were produced at —60 deg. F., in spite of the fact that the crude sources are entirely different and that the concentrations of aromatics in the charging stocks vary from 9.5 to 31 per cent by volume.

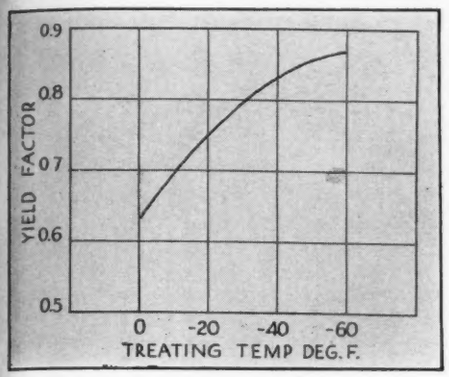

Fig. 6—Yield factor vs. temperature

Effect of Extraction Temperature on Yields

The yield of blending stock of high octane number obtainable from a given straight-run naphtha depends upon its content of aromatics and upon the extraction temperature. Yields versus extraction temperatures are plotted in Fig. 4 for the blending stocks produced from the Mid Continent, Sumatra, and South Texas naphthas.

The yields of blending stock obtainable from the Sumatra naphtha at —20 and —60 deg. F., as indicated in Fig. 4, were calculated from the following equation:

$$Y = \frac{A - 1.5}{F}$$

in which:

Y = yield of extract, per cent by volume.

A = aromatics and unsaturates in the charging stock, per cent by volume.

F = a constant varying with the extraction temperature.

This formula may be used to predict roughly the extract yields obtainable from straight-run naphtha cuts. The value of *F* for various extraction temperatures is shown in Fig. 6. The relationship between extract yields and octane numbers in the case of the South Texas stocks is shown in Fig. 5.

Octane Number of Extracts Increased by Fractionation

Even at low extraction temperatures, liquid sulfur dioxide will dissolve a certain amount of paraffins and naphthenes along with the aromatics. The experiments further show that paraffins and naphthenes of lower boiling range are more soluble in the solvent than those of higher boiling range. While this is known from experience with lubricating oils having such different characteristics as neutral oils and cylinder stocks, it was surprising to note that a similar situation exists in the case for naphtha with a fairly narrow boiling range. For example, an extract from a somewhat different South Texas naphtha than the one described above, having an aromatic content of 78.2 per cent by volume and a boiling range of from 222 to 333 deg. F., was closely fractionated into five successive 20-per-cent cuts. As may be seen from Table 5, the aromatic concentration of these fractions increases with the average boiling point. The result is that the octane numbers of the cuts also increase with the average boiling point. The original extract, having an octane number of 90, yielded fractions with octane numbers from 81 to above 99.5. The yield of 100-octane-number stock is estimated to be 50 per cent of the original extract.

Other Important Properties of Sulfur-Dioxide Extracts

Most notable among the other properties of extracts shown in Tables 1 to 3 are the Kauri butanol numbers, which vary from 71 to 89 depending upon the extraction temperature. These stocks are, therefore, particularly suitable for use as high-grade lacquer solvents. They possess the added advantage over synthetic lacquer solvents of having a smooth evaporation curve.

The aniline points, which are also used to indicate the solvent power of lacquer solvents, are very low. The South Texas extracts, for example, have aniline points of —13 to —20 deg. C.

The extracts obtained from the South Texas and Mid Continent naphtha, when re-run to about 2 per cent bottoms, met the gum specifications of the ASTM copper-strip test (method D-130-30) and the Army Air Corps copper-dish test (U. S. Army specification 530.1). The latter test was met in some cases even without re-running the caustic-washed extracts. The extracts also passed the most severe test in which a copper strip is exposed to the vapors and the liquid during the ASTM distillation. This procedure is specifically used to test the corrosiveness of lacquer solvents.

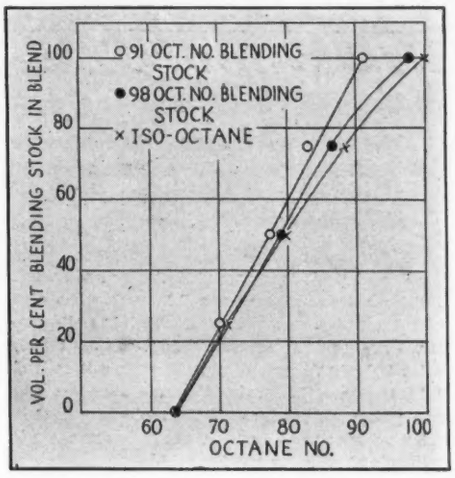

Fig. 7—Octane numbers of various blends

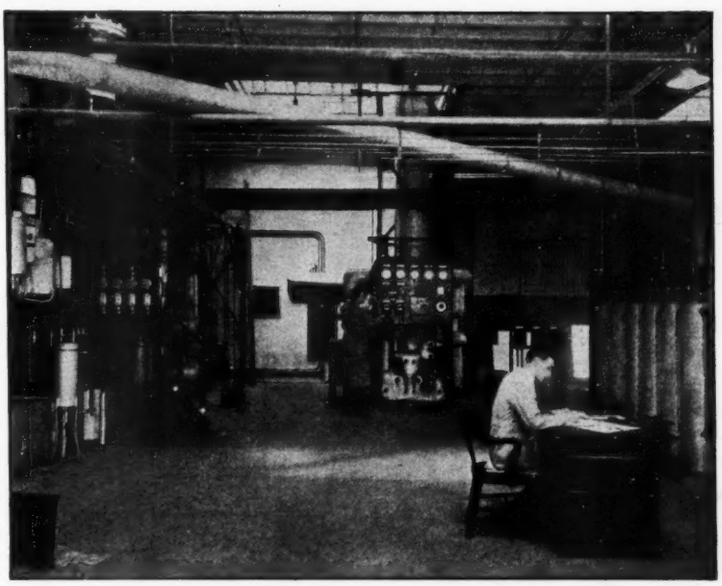

Fig. 8—Apparatus for laboratory extractions

In order to determine the blending characteristics of some of the extracts produced, mixtures were prepared containing 75 per cent, 50 per cent, and 25 per cent of a 91- and 98-octane-number extract, and of *iso*-octane, respectively. The 91-octane number extract was obtained by treating the South Texas stock with 70 per cent sulfur dioxide at —60 deg. F., as shown in Table 3 under experiment 10. The 98-octane-number blending stock was produced by fractionation of an extract obtained at —60 deg. F. A Mid Continent straight-run naphtha, boiling between 103 and 266 deg. F., with an octane number of 63.4, was used for the blending tests. Table 6 and Fig. 7 show the octane numbers of the respective blends in relation to the amounts of extract or *iso*octane present. It will be noted that the blending value of the 98-octane-number extract compares very favorably with *iso*octane, and that the blending values of these extracts are about the same as their CFR octane numbers.

Volatility of Blending Stocks

The boiling ranges of the light Mid Continent stock and of the blends with 91-octane-number extract are given in Table 7 in comparison to that of a commercial gasoline. The initial boiling points of the blends are high, because the light Mid Con-

TABLE 5—FRACTIONATION OF SOUTH TEXAS SULFUR-DIOXIDE EXTRACT

	Sulfur-Dioxide Extract 0-100 Per Cent	Cut No. 1 0-20 Per Cent	Cut No. 2 20-40 Per Cent	Cut No. 3 40-60 Per Cent	Cut No. 4 60-80 Per Cent	Cut No. 5 80-98 Per Cent
Gravity, deg. A.P.I.	35 6	41 8	35 8	35 6	32 9	32 5
Doctor test	sweet	sweet	sweet	sweet	sweet	sweet
Kauri gum No.	81 2	72 9	85 5	80 8	85 4	83 1
Unsaturates and aromatics, per cent by volume	78 2	53 2	81 3	82 0	92 7	92 0
Octane No., CFR method	89 9	81 1	92 2	94 1	99 5+	99 5+
ASTM Distillation, Deg. F.:						
Initial boiling point	222	194	224	246	273	284
10-per-cent point	239	201	227	252	276	289
50-per-cent point	258	211	228	262	278	295
90-per-cent point	291	224	231	275	280	312
End point	333	244	254	290	296	335

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tinent cut does not contain the lowest boiling constituents which are normally present in motor fuels. The quantity of the light ends to be added to the blends is limited only by the specification for vapor pressure. It will be noted that the 50 per cent boiling point of blend 2, containing 50 per cent by volume of extract, is about the same as that of the commercial gasoline. We find that the ASTM

TABLE 6—OCTANE NUMBER OF BLENDS

Blending Stocks in Blends (Per Cent by Volume)	Octane No. of Blends with:		
	Sulfur Dioxide	Extracts	*Iso*octane
100	91.1	98 0	100 0
75	83 1	86 5	88 5
50	77 5	79 0	79.7
25	70 0	71 5	71.0
0	63 4	63 4	63 4

distillation characteristics (volatility) of the extracts produced from a given charging stock at temperatures between 0 and —60 deg. F. are practically the same. Obviously, then, it is desirable to extract at such temperatures at which blending stocks of the highest possible octane numbers are obtained.

Instead of the 63.4-octane-number light stock used in the above blends, many light straight-run cuts of 70-octane-number and higher are available which, when blended with 50 per cent by volume of 90-octane-number extract, would yield an 80-octane-number blend without the addition of casinghead gasoline.

Lead Response of Blends

The octane numbers of the blends may be further increased by the addition of tetraethyl lead. The lead susceptibility is shown in Table 8 for

TABLE 8—LEAD RESPONSE OF BLENDS CONTAINING HIGH-OCTANE-NUMBER EXTRACTS AND ISOOCTANE, RESPECTIVELY

Blending Stock in Blends (Per Cent by Volume)		Octane No. of Blending Stock	Octane No. of Blend	Octane No. of Blend Plus 1 cc. of Tetraethyl Lead Per Gallon	Octane No. of Blend Plus 2 cc. of Tetraethyl Lead Per Gallon
0		....	63 4	....	....
25	extract	91 0	70 0	77 0	80 1
50	extract	91 0	77 5	81 7	83 6
50	*iso*octane	98 0	79 0	82 8	84 7
50	*iso*octane	100 0	79 7	84 9	....

blends containing 25 per cent and 50 per cent 91-octane-number extract, 50 per cent 98-octane-number extract, and 50 per cent *iso*octane, respectively. Although the aromatic blends respond less favorably to tetraethyl lead than the *iso*octane blend, a material improvement is obtained.

Extractions in the laboratory (See Fig. 8) were carried out in a complete small-scale Edeleanu pilot plant where sufficient stock was available. In other cases, 4-stage batch countercurrent treatments were made.

The pilot plant is equipped with a tower mixer 10 ft. high and 2 in. in diameter, packed with ¼-in. Raschig rings. Settling chambers are provided for raffinate and extract solution at the top and bottom of the tower, respectively. The tower is provided with a jacket which is divided into three different sections covering the upper, medium, and lower part. A low-freezing-point naphtha, functioning as a brine and being cooled indirectly by a two-stage ammonia refrigerating unit, is pumped through the pre-coolers for charging stock and solvent and through the various jacketed sections of the extraction tower in order to hold the desired temperatures. This arrangement makes it possible to maintain a temperature gradient in the tower—holding, for example, 0 deg. F. in the solvent pre-cooler and in the upper part of the extraction tower, —30 deg. F. in the middle section, and —60 deg. F. in the bottom section of the tower by adjusting the amounts of cold brine pumped to the various parts of the unit. A liquid pressure of about 50 lb. per sq. in. is maintained in the tower to prevent formation of pockets of sulfur dioxide, and also to force the raffinate—and extract—solutions to the evaporators. The solvent is recovered by distillation at atmospheric pressure; the sulfur dioxide is liquefied by a compressor and a water-cooled condenser, from which it runs to storage for re-use. Vacuum evaporators are not required, as the sulfur dioxide may be readily removed under atmospheric pressure at temperatures equaling the the 20- to 30-per-cent ASTM point of the stocks. The solvent recovery stills are normal fractionating columns consisting of a fractionating section, stripping section, and re-boiler. Liquid sulfur dioxide is used as reflux. From the solvent recovery stills the products are pumped to caustic treaters.

Capacity of Plant

The quantities of charging stock and solvent are measured in graduated tanks, from which they are pumped into the pre-coolers by Hills-McCanna piston pumps of variable stroke. The capacity of the pilot plant is 2 gal. per hour of charging stock at a treating rate of 100 per cent solvent. The 10-ft. tower is equivalent to 4 to 5 equilibrium stages.

TABLE 7—BOILING POINTS OF BLENDS, CONSISTING OF MID CONTINENT LIGHT GASOLINE CUT, AND 91.1-OCTANE-NUMBER EXTRACT

No. of blend	....	1	2	3	...	
Extract in blends, per cent by volume	0	25	50	75	100	Commercial gasoline
Gravity, deg. A.P.I.	69 8	59 5	50 0	41.7	33 7	60.2
Octane No., CFR method	63 4	70 0	77 5	83 1	91.1	71.0
ASTM Distillation, Deg. F.:						
Initial boiling point	103	112	118	140	247	81
10-per-cent point	142	154	175	214	267	124
30-per-cent point	166	182	212	252	279	187
50-per-cent point	182	205	243	276	292	239
70-per-cent point	197	235	279	299	307	285
90-per-cent point	224	302	322	331	337	349
End point	266	357	376	386	394	394

TABLE 9—UTILITY REQUIREMENTS AND COSTS PER 42-GALLON BARREL OF CHARGE

Treating temperature Solvent ratio		0 Deg. F. 70 Per Cent		—60 Deg. F. 70 Per Cent	
		Per Barrel		Per Barrel	
Unit Costs		Requirement	Cost (Cents)	Requirement	Cost (Cents)
High-pressure steam, 125 lb. gage	22 cents per 1,000 lb.	30 lb.	0 66	30 lb.	0 66
Low-pressure steam, 10 lb. gage	7 cents per 1,000 lb.	40 lb.	0 28	40 lb.	0 28
Cooling water, 85 deg. F.	0 6 cents per 1,000 gal.	1,260 gal.	0 75	1,400 gal.	0 84
Power	0 7 cents per kilowatt hour	2 75 kwh.	1 93	4 0 kwh.	2 80
Solvent	3 3 cents per pound	0 30 lb.	0 99	0 30 lb.	0 99
Total, cents per barrel		.....	4.61	.....	5.57

Commercial Unit

A 6,000-bbl. commercial plant, operating at low temperature, has been in operation for about eight months. Evaporating liquid ethane is used in this plant for cooling the distillate and solvent to the extraction temperature, rather than a brine system as described for the pilot unit. Liquid propane is used to condense the ethane. This two-cycle refrigeration system has proved to be very efficient for producing low temperatures.

Solvent is recovered in this unit by means of a multiple-effect evaporation system, as is normally done in Edeleanu plants, with the exception that fractionating columns are used to hold back light-oil vapors. The vacuum stage is by-passed during naphtha operation.

Utilities Consumption

The operation of a naphtha plant at —60 deg. F. does not increase the utility requirements much over those of a unit operating at 0 deg. F. Table 9 shows utility requirements and costs for extraction at 0 and —60 deg. F., based on 70 per cent solvent in each case.

Steam consumption and solvent loss are the same at normal and low-temperature extraction. Cooling-water requirements for low-temperature treatment are increased by about 10 per cent, and power consumption by 40 to 50 per cent. Labor requirements for plants of large size are three operators per shift and one foreman per day in either case. On the basis of the utility costs shown in Table 9, total operating costs for a 3,000-bbl. unit including maintenance, repairs, and royalty, are 11.4 cents per barrel of charge for 0 deg. F., and 12.5 cents per barrel for operation at —60 deg. F., showing an increase of only 10 per cent.

A notable feature of this process is that the refiner is not limited to naphtha treating alone. The addition of a vacuum stage to the recovery system will make it possible to treat high-sulfur kerosines and light lubricating oils. In the latter case, the refrigeration plant required for naphtha treating is operated at higher temperature or it is completely by-passed.

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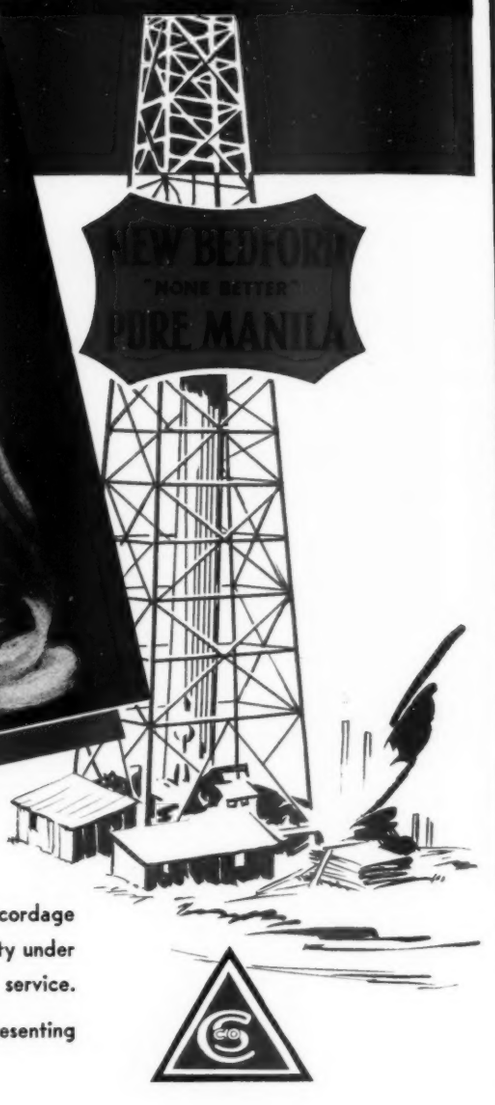

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Recent Developments in the Use of Contact Clays

By S. R. FUNSTEN
Filtrol Corp., Philadelphia, Pa.

The technique of petroleum refining has undergone changes of a revolutionary nature in the past decade. The advances have been particularly marked in the fields of motor-fuel and lubricant manufacture. The effect of this progress has been the creation of new standards of quality and lowered costs, thus contributing to more intensive studies of the older supplementary refining methods in which bleaching clays have played an important part. Studies of bleaching clays, and more specifically of that class of fine-mesh adsorbents known as contact clays, have not only

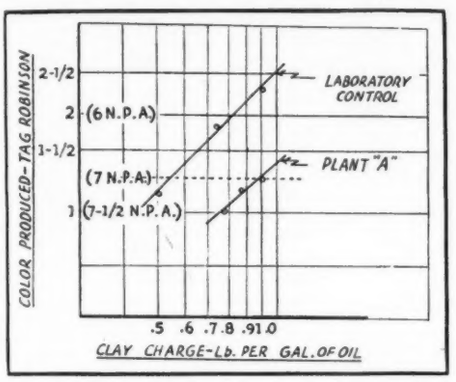

Fig. 1—Comparison of laboratory and plant decolorization; contacting Mid-Continent acid-treated residuum at 550 deg. F.

resulted in substantial increase in operating efficiency on the part of the refiner, but to a marked degree have led to new potential uses which heretofore have not been fully recognized.

Much has been published in trade journals relative to commercial methods and types of equipment used in the application of contact clays to the petroleum-refining industry. Also, many excellent articles have been published more recently concerning theories relating to the bleaching action of clays.[1] There has been a noticeable lack of information as to the practical application of contact clays and the evaluation of the factors relating thereto. The following discussion deals with this phase of the subject in the light of the more recent developments.

Industrial Adsorbents

The commercially important adsorbents in the order of the tonnage consumed, together with principal usages, are as follows:

Bleaching clays—petroleum and fatty oils, catalysts.

Boneblack—sugar refining.

Decolorizing carbon—liquids, aqueous and non-aqueous.

Gas-adsorbent carbon—purification of gases.

Silica gel—dehumidifying, refrigeration.

Activated alumina and bauxite—vapor and moisture adsorption, catalysts.

Some idea as to the magnitude of the bleaching-clay industry, and particularly the expanded demand for contact clays in the past 15 years, may be seen in the following:

U. S. BLEACHING-CLAY MANUFACTURE

	Bleaching-Clay Tonnage[2]			Estimated contact clay only	
Year	Natural	Activable	Total	Tons	Per cent of total bleaching Clay
1920	128,487	0	128,487	6,424	5
1935	227,745	*82,396	310,141	155,070	50

*1934.

Approximately 90 per cent of the present bleaching clay tonnage is consumed in the petroleum industry. The remaining 10 per cent is used for the most part in the fatty-oil industry.

From the standpoint of sales price, bleaching clays rank the lowest of any member of the group of industrial adsorbents. The field is represented by materials of strikingly different physical and chemical properties, the essential feature in all cases being the decolorizing property. The type of color to be removed and the degree of removal determine to a large degree the characteristics which a clay must have in order to function most efficiently. However, due to the more recent improved supplementary methods of refining, the decolorizing function of bleaching clays is now sometimes subordinate to other properties.

In the case of a well-selected clay, it is frequently possible to obtain optimum conditions by modifications of operating technique. Other clays do not respond to such changes and, hence, are at a disadvantage.

It should be noted that the broad title "bleaching clays" refers to both material in granular form suitable for percolation as well as the fine-mesh contact clays. The latter material which is the subject of discussion, may or may not be derived from the same raw source as the percolation grade. Raw material best suited for contact purposes is generally not satisfactory in percolation. Contact clays may be either naturally active or artifically activated. In either case the material, as commercially used, is dried and ground to predetermined moisture and mesh specifications. The free moisture content of contact clays will range from 5 to 20 per cent. The screen test for these clays ranges from 60 to 95 per cent through 200 mesh. More recent studies have clearly demonstrated that the presence of a certain amount of free moisture in a contact clay is advantageous when contacting above 210 deg. F. This is particularly true in the case of the more delicately structured activated clays. The point is illustrated in Table 1, wherein it is shown that domestic activated clay is most efficient for cylinder-stock decolorization at approximately 15-per-cent free moisture content.

It appears from other tests that the free moisture content of typical natural contact clays may be reduced to as low as 5 to 10 per cent without injuring the clay efficiency.

The recent expanded use of domestic activated clays may be explained in part by the fact that they average three to four times more efficient than the natural contact clays and, while higher in price, are justified on the basis of lower clay consumption, less equipment requirements, lower handling costs, and reduced oil loss. In many respects this type of clay is ideal.

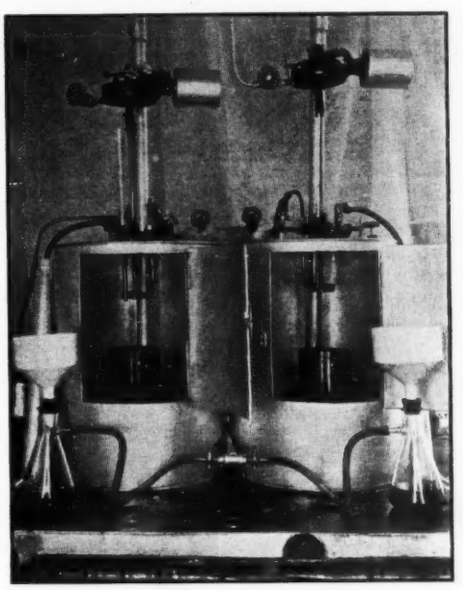

Fig. 2—Laboratory contacting apparatus

TABLE 1—EFFECT OF FREE MOISTURE CONTENT ON CLAY EFFICIENCY

In this test a laboratory artifically-activated clay, having a free moisture content of 25 per cent, was carefully dried in a Freas oven at 210 deg. F., and samples thus prepared of lower moisture content. These samples were evaluated on Mid-Continent cylinder stock using contact temperature of 500 deg. F., time 20 min. The results follow:

Material—	Free moisture (per cent)	Efficiency (per cent)
Activated clay	0	75
Activated clay	5	86
Activated clay	10	96
Activated clay	15	100
Activated clay	20	95
Activated clay	25	87

Simple addition of water to the foregoing dehydrated samples failed to revive the efficiency proportionally.

Among the characteristics sought by petroleum refiners in contact clays are the following:

Lubricating Oils and Specialties:

High decolorizing property.

Low oil-retention value.

High filterability and satisfactory clarification properties.

Bloom improvement or maintenance.

Satisfactory medium for color stabilization,

(Continued on Page 60)

***A.P.I.*—Presented before the mid-year meeting, June 1 to 3, Colorado Springs, Colorado**

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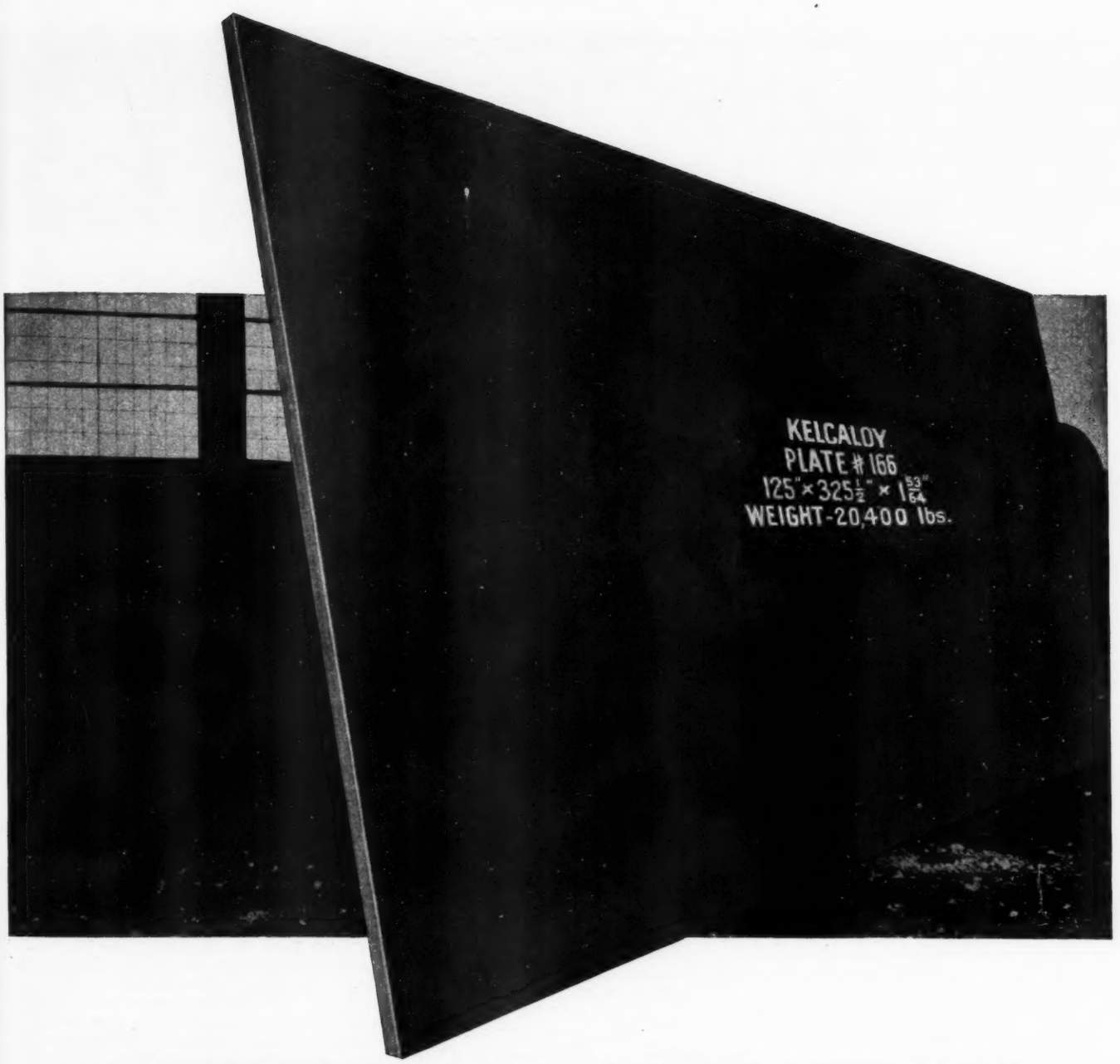

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carbon reduction, oxidation, and emulsion-test improvement.

Motor Fuels:

High decolorizing property.

Gum improvement.

Stabilizing properties.

Satisfactory catalyst and polymerizing medium.

Octane maintenance or improvement.

Study of adsorptive mediums with special selective action for one or more of the above characteristics is a trend in present research.

It is of interest to compare some of the foregoing characteristics with the respective chemical and physical properties of various commercial adsorbents (Table 2).

Notable in quality are the more recent improved types "A" and "C" of contact clays. Chemical analysis, it will be observed, is of little significance.

Present research not only consists of exploration of new fields of raw material, but also of a more intelligent study of existing materials, individually or combined, designed to furnish an adsorptive medium specifically adapted to the various needs of the industry.

The methods of testing contact clays are at considerable variance throughout the industry. The application of various methods of procedure in the past has frequently given results which have been difficult to check and impossible to correlate to plant practice. Research along this line has gone a long way toward remedying this condition. The outline of laboratory procedure described herein may be used as a guide for lubricating-plant contacting operation. Time does not permit a discussion of a large variety of tests adapted to more specialized uses of contact clays. A practical example of control-test application is shown in Fig. 1.

It will be noted here that test points both for laboratory and plant lie in a straight line in fair conformance to the adsorption isotherm. Furthermore, the plant and laboratory lines are substantially parallel. By ascertaining the relative clay consumption at 1¼ Tag-Robinson as indicated by these lines, it will be observed that plant "A" is operating at but 56-per-cent potential efficiency. In terms of clay values alone, this represents a handicap approximating 35 cents a barrel against the potential. While it may not always be possible from a practical standpoint to duplicate "potential" operating efficiency, the laboratory control test can be accepted as a satisfactory guide.

TABLE 2—PHYSICAL AND CHEMICAL DATA FOR COMMERCIAL CONTACT CLAYS

Clay—	"A" Domestic activated clay (per cent)	"B" Domestic natural clay (per cent)	"C" Domestic natural clay (per cent)
Analyses (Dry Basis):			
Silica	71.71	67.70	68.30
Titania	0.05	0.66	0.78
Alumina	19.78	12.73	24.20
Ferric oxide	1.20	4.31	2.68
Ferrous oxide	0.07	0.23	0.22
Manganous oxide	0.01	0.03	0.01
Magnesia	5.13	11.62	1.31
Lime	0.27	1.63	0.75
Soda	0.06	0.03	0.18
Potash	0.06	0.81	1.28
Phosphoric anhydride	0.06	0.15	0.11
Carbon dioxide	None	0.06	0.06
Chlorine	0.03	0.04	0.03
Sulfuric anhydride	0.97	0.03	0.03
Total	99.40	100.03	99.94
Physical Inspections:			
Volatile content, %	21.0	16.0	15.0
Volume weight, lb. per cu. ft.	39.0	26.0	36.0
Mesh, % through 200	93.0	94.0	92.0
Decolorizing efficiency, % (compared to activated clay on typical lubricating stocks)	100.0	20-30	25-35
Bloom producing property	Good	Medium	Medium
Oil retention.* % (total oil and asphalt) basis, clay charge.	50.0	75.0	38.0
Press rate, per cent (compared to activated clay)	100.0	120.0	110.0

*This should not be confused with "recoverable oil retention" referred to in later discussion of clay economics.

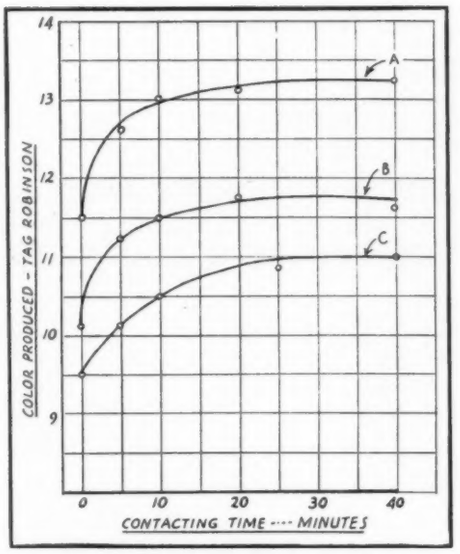


Fig. 3—Effect of time on decolorization; contacting solvent-treated lubricating distillate (viscosity, 70 sec. at 210 deg. F.)

Legend
A—contacting at 450 deg. F.
B—contacting at 400 deg. F.
C—contacting at 300 deg. F.

Details of the laboratory-contact, oil-retention, and filterability tests are furnished in Tables 3 and 4 and in Fig. 2.

TABLE 3—TEST METHOD FOR DETERMINING THE DECOLORIZING EFFICIENCIES OF CONTACT CLAYS

APPARATUS

1 Contacting apparatus (see Fig. 2). Contactor pot is 4 in. in inside diameter by 6 in. high. (Stirrer paddle is ¼ in. by 2½ in. on ¼-in. steel shaft at 45-deg. slope. Rate, 400 r.p.m.).
1 Suction filter.
1 Optical-density color machine.*

PROCEDURE

1. Weigh 200 grams of oil stock into the contactor.
2. Introduce weighed portion of clay.
3. Assemble apparatus as shown in Fig. 2.
4. Start stirrer, and heat oil-clay mixture rapidly to 300 deg. F.
5. Introduce † super-heated steam or inert gas, and continue heating to the desired temperature, increasing at a rate of 20 to 30 deg. per minute.
6. Maintain this temperature for 20 min. or the desired length of time.
7. Withdraw heat and allow to cool to 350 deg. F.
8. Withdraw steam or inert gas.
9. Stop stirrer, remove pot from assembly, and filter the oil through a suction funnel.
10. Obtain optical-density color* of the finished oil.

CALCULATION OF RESULTS

After making runs using varying amounts of the clays to be evaluated, the optical-density colors of the contacted oils are plotted as ordinates against the weight per cent clay, as abscissae, to determine the comparative efficiencies.

ACCURACY

Results obtained by this method are found to be reproducible within 5 per cent.

*Or other suitable color-measuring device. †22 cu. in. gas per minute at 250 deg. F. and 760 mm. (equivalent 1 cc. steam condensate per minute).

TABLE 4—TEST METHOD FOR DETERMINING OIL RETENTION AND PRESS RATE OF CONTACT BLEACHING CLAYS

APPARATUS

Filter tube in constant temperature bath (see Fig. 4). Bottom cap assembly contains disc of 80-lb. blotting paper supported by 60-mesh bronze wire. Tube is 1⅛ in. extra-heavy pipe 12 in. long.
Mechanical stirrer and hot plate.

MATERIAL

Oil to be processed.
Clay to be used (must be dry).

PROCEDURE

Thoroughly clean filter tube and base cap assembly. Renew blotting paper and gasket. Screw cap on tightly, and close bottom valve.
Weigh clay charge to 0.1 gram accuracy (clay charge should be sufficient to give ⅞-in. to 1-in. cake thickness in tube, usually requiring 15 to 25 grams. Weigh oil charge into beaker (sufficient quantity to produce a slurry containing 13 per cent clay). Add clay charge to oil, and weigh beaker containing oil and clay.
Mechanically agitate oil-clay mixture, and heat to desired maximum temperature, maintaining this temperature for 5 min. Cool to desired filtering temperature.
Weigh beaker containing oil-clay mixture to determine loss on heating.
Reheat oil-clay slurry to filtering temperature, and immediately pour slurry into filter tube.
Screw on top cap tightly, and place thermometer in well. Admit hot air (290 to 300 deg. F.) into tube, gradually increasing pressure up to 45 lb. per sq. in. Simultaneously open bottom valve, and note time. When oil is expelled from tube and air blows through bottom valve, record filtering time and volume of filtrate. Maintain 45-lb.-per-sq.-in. air pressure in tube, and blow for 15 min. Release pressure and remove top cap. Determine cake thickness by measuring outage in tube before and after run.
Weigh charging beaker to obtain drainage loss of oil-clay slurry.
Remove bottom cap, and push clay from tube into tared jar by means of a rod equipped with a rubber stopper on the end. Scrape all clay from blotting paper and inside of tube with a small spatula, and transfer to the jar.
Weigh jar containing clay cake. Extract cake with naphtha, and dry in oven. Weigh dry cake.

CALCULATION OF RESULTS

I. *Oil Retention*

1. Clay charged equals clay weighed into beaker minus (per cent clay in slurry times drainage loss).
2. Clay in press cake equals clay charged (*1*) minus loss on heating.
3. Total loss to press cake (including oil and asphalt) equals cake weight minus weight clay in press cake (*2*).
4. Total per cent loss to press cake (including oil and asphalt) basis weight of press cake equals:

$$\frac{\text{loss to press cake } (3) \times 100}{\text{weight press cake}}$$

5. Total per cent loss to press cake (including oil and asphalt) on basis of clay charged equals:

$$\frac{\text{loss to press cake } (3) \times 100}{\text{clay charged } (1)}$$

6. Per cent recoverable oil in press cake equals:

$$\frac{(\text{weight press cake minus weight of dry extracted cake}) \times 100}{\text{weight of press cake}}$$

7. Per cent recoverable oil only on basis clay charged equals:

$$\frac{(\text{weight press cake minus weight of dry extracted cake}) \times 100}{\text{clay charged } (1)}$$

II. *Press Rate*

Press rates, cc. per minute, equal:

$$\frac{\text{cc. filtrate}}{\text{minutes filtering time}}$$

ACCURACY

This method of determination has been found to be reproducible to within 2 lb. oil per 100 lb. clay charged; while the press rates obtained are reproducible within 10 per cent.

Contact Test. The equipment (see Fig. 2) and procedure indicated for this test is similar in some respect to that recently described by V. A. Kalichevsky and J. W. Ramsay.[3] However, provision is made in the test herein described for the introduction of inert gas into the oil during contacting and a suitable outlet leading to a condenser for the purpose of collecting moisture and any overhead products. This modification is considered a necessary adjunct to accurate determinations.

a. Container The use of closed metal (steel) has been adopted rather than glass, since in the latter case irregularities result due to poor conducting and local over-heating. Closed containers avoid exposure to the detrimental effects of air during contacting.

b. Agitation Agitation by mechanical means as well as by introduction of inert gas to the oil at elevated temperature has been shown to be necessary to obtain maximum accuracy in reproducing results. Tests have shown either superheated steam or carbon dioxide to be suitable "gas" mediums. The former is more readily available, whereas the latter is easier to regulate and eliminates "boiling over." Standardization of the volume of inert-gas is important; otherwise considerable variation in results may occur.

c. Time and Temperature. While it has been shown that the optimum time and temperature conditions vary within a wide range, depending upon type of clay and nature of oil service, it is desirable that at least one of these factors be held constant in routine tests. The time recommendation given in the laboratory-contact test (Fig. 2)

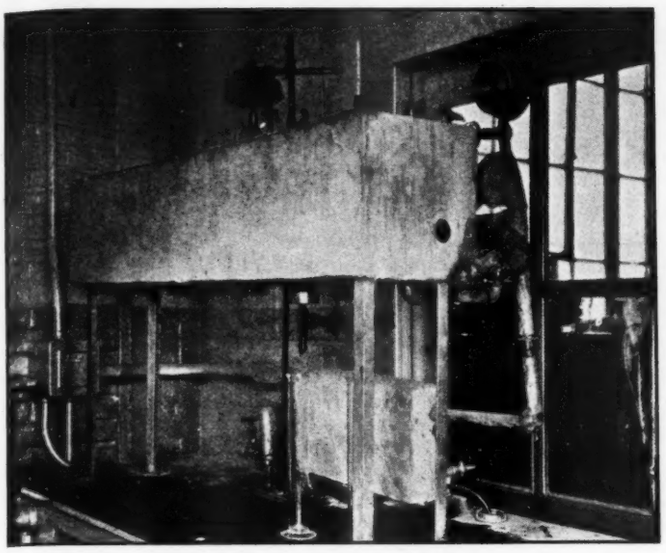


Fig. 4—Laboratory oil-retention and filter-rate apparatus

has been arrived at after careful studies, wherein it appears that equilibrium is reached for all practical purposes in 20 min. at top temperature in representative service (see Fig. 3). These conditions may easily be altered to meet specific refining purposes.

d. Color Measurement. The type of instrument preferred for measuring color depends largely on the nature of the work, i.e., plant control, research, etc. Greatest accuracy is obtained by optical-density color methods;[4] hence, these will serve best for technical studies of a research nature. For routine plant control it is satisfactory to use a commercial color test, of which the Tag-Robinson and Lovibond methods are to be preferred; since these, in some measure, express color intensity. The NPA color accuracy may be increased to a marked degree by the adoption of one-quarter-shade chemical standards to supplement the usual full and half-number ASTM color glasses.

e. Interpretation of Results. While some deviations have been observed in the application of Freundlich's adsorption isotherm to decolorization of clay, our experience has been that the use of this principal in determining relative clay efficiencies is sufficiently accurate for practical purposes in refinery work (see Fig. 1). It is advantageous in interpreting test results, where time and temperature are constant, to plot the per cent clay used against the color intensity of the treated oil on logarithmic paper to give a straight line.

Oil-Retention Test. The practical value of a clay with good filterability and relatively low oil retention is well known, particularly by those refineries that do not find it economical to recover oil soakage. Many refineries are not equipped to measure accurately oil lost in the contact operation, particularly from the standpoint of comparing competitive contact clays. The improved method as described, is designed more accurately to parallel normal plant practice wherein pressure is used in Sweetland-type filter presses for separation of oil from spent filter cake. (See Fig. 4).

Any consideration of this subject necessarily involves the consideration of specific requirements. The initial use of contact clays in the domestic petroleum industry some 15 years ago centered primarily in the decolorization and neutralization of lubricating oils of relatively low viscosity by contact filtration. The essential feature of this process consists of heating a mixture of contact clay and oil to a predetermined temperature, maintaining the mixture at this temperature for a given time, cooling, separating oil from clay by a suitable means, and removal of the clarified oil to storage. The process is fundamentally so simple that full appreciation was not had of important factors influencing cost of manufacture and quality of product—which, in the early stages, resulted in the construction of some unduly complicated plants. The undesirable features in many of the older plants are gradually being eliminated.

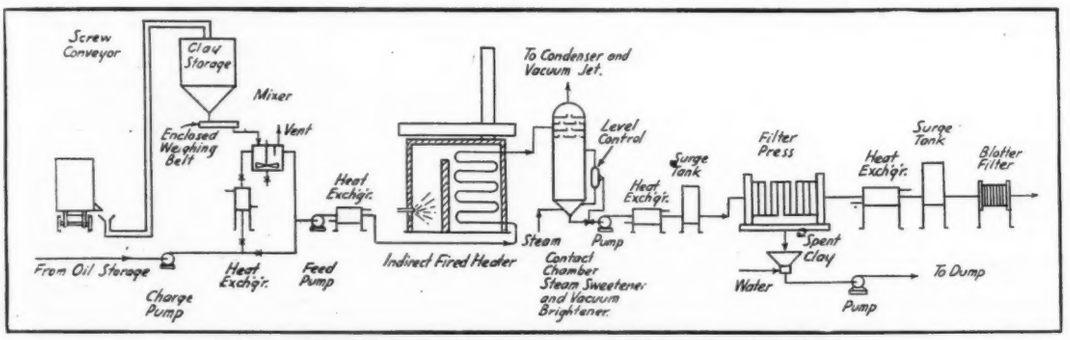


Fig. 5—Flow diagram for continuous contact filtration plant

Filtrol fractionation, a more recent adaptation in the use of contact clays, in brief involves the fractional reduction of oil in the presence of contact clay to a residual of predetermined specifications. The spent clay is then separated from the residual as in the contact-filtration process. A plant installation of filtrol fractionation has been discussed in trade journals.[5] The recent adoption of filtrol-fractionation processing by three leading refineries in the Pennsylvania oil region is a practical illustration of increasing interest in this field.

Contact filtration is subject to many controllable variables. The realization of maximum efficiency may only be had by proper control of these variables, although many plants operate at relatively high efficiency even though the conditions of operation deviate some from those established for optimum performance. The factors affecting the use of contact clay may be discussed under the following headings:

1. Service requirements.
2. Equipment improvements and operating technique.

Service Requirements

Before establishing optimum conditions for operation, it is essential to make a careful study of service requirements, viz., the nature of oil to be refined, the quality of product desired, and the type of clay best suited for the purpose.

Lubricating Distillates—Viscous and Nonviscous. The color of these types of charging stock rarely exceed 7 NPA, and more commonly for the lighter oils (i.e., Saybolt viscosity of 100 to 300 at 100 deg. F.) is in the range of 2 to 3 NPA. The service requirements for both the light and heavy grades are, therefore, moderate; since the finished oils in this group generally fall within the range of 1½ to 5 NPA. The application of improved fractionating equipment to Pennsylvania or high-grade Mid-Continent stock in more recent years has made it possible, in some instances, to contact-finish without preliminary treatment. Solvent treatment preliminary to contacting has added further to the variety of stocks that may be finished by direct contacting with clay to satisfactory quality. The following are typical solvents: phenol, Duo-Sol, furfural, nitrobenzene, propane, and chlorex.

In the case of the poorer-grade type of lubricating distillates, a light acid treatment, i.e., 3 lb. to 12 lb., sulfuric acid per barrel, may be used. It is important in the case of acid-treated oils that the pepper sludge be removed as completely as possible. This can be done by controlled coagulation and gas-blowing. The neutralization number of the sour contact-plant charging stock should not exceed 2; otherwise it will be found that excessive amounts of clay will be required to obtain desired results. Unfortunately, it does not follow that a contacted oil is neutral when the desired color is reached. The stability of color depends to a large extent on complete removal of acid bodies and

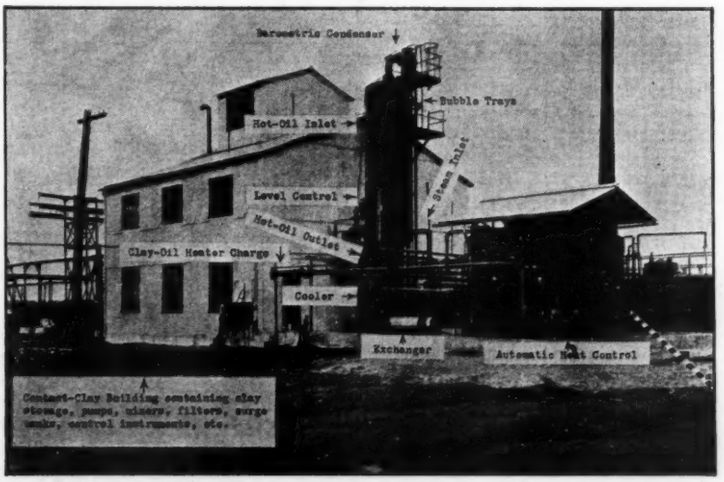


Fig. 6—Recent plant pipe-still and vacuum-stripper installation

other impurities during contacting. In previous years it was considered impossible to obtain this result without the use of excessive amounts of clay to serve the purpose of a neutralizing medium. The more recent procedure involving the use of the higher contacting temperatures and more effective stripping of the contacted stock makes it possible to obtain neutrality and stability quite satisfactorily at considerably less cost. Acid numbers in the range of 0.01 to 0.05 are being obtained for both natural and activated clays in actual service.

The amount of contact clay used for lubricating distillates varies from 0.5 to 10 per cent, depending upon the oil and clay. Filter-press capacities of from 3½ gal. to 10 gal. per square foot of filtering area per hour are quite customary.

Long Residuum, Steam-Refined Cylinder Stock and Bright Stock. Stocks of this type from Pennsylvania crude are generally delivered to the decolorization process without preliminary chemical treatment. In some instances these stocks are solvent-treated. The color load on bleaching clays in refining this type of oil is very high, frequently starting with a color intensity of 3,000 units and decolorizing to a filtered oil with but 250 to 450 units (6 to 7½ NPA). Inasmuch as the oils of this type are in the high-boiling range, it is possible to apply contacting clays at relatively high temperatures (equivalent to flash point of oil or higher) without injury to the oil. Clay requirements will range from 5 to 20 per cent, depending upon the oil and the clay. Filter rates of from 2 gal. to 4 gal. per square foot of filter area per hour are obtained.

Cylinder stocks of mixed-base or naphthenic origin are generally solvent-treated and/or acid-treated preliminary to clay contacting. The color of this type of stock in general does not exceed 1,500 density units. These stocks, however, are frequently decolorized to lighter colors than the Pennsylvania type of stock. Clay efficiencies for the solvent- and acid-treated stocks are higher than those treated with acid alone. This in part is due to the generally higher acidity and pepper-sludge content of the latter group. In spite of efforts by the refiner to maintain low acid numbers (less than 2) on the sour stock entering the contact plant, it has been observed in some instances that the acid number in actual practice is as high as 5 or 6. The fact that high acid stocks require increased consumption of contacting clay does not imply that preneutralization of such stocks with alkali or neutralizing clay is necessary or advisable. On the contrary, as expressed heretofore, contact clay, whether natural or activated, is a very satisfactory medium for reducing acidity and unstable compounds at relatively low cost under conditions of processing outlined herein. For example, in a recent test of sour Mid-Continent cylinder stock with an acid number of 6, using 0.5 lb. activated clay and decolorizing to 3¼ Tag-Robinson color (235 optical density), the finished-stock acid number was 0.05. The color of the oil after 48 hours at 200 deg. F. was 457 optical density. The result was obtained under conditions wherein the oil from the pipe heater was delivered to a vacuum stripper tower (28 in. vacuum) and held for 30 min. preliminary to cooling and filtering. A significant feature of the test is the fact that no steam whatever was introduced into the oil.

Lubricating Stocks—Specialty Type. Lubricating stocks of the specialty type, such as transformer oils, turbine oils, petrolatums and waxes, must be considered as individual problems; and the exact time, temperature, and type of clay required for refining in any case should be predetermined in the laboratory. In general, these specialties may be handled in the usual type of contact equipment, but require extra care in connection with the heating and stripping phase of processing in order to promote best conditions for obtaining a satisfactory emulsion test, odor, and taste removal, etc.

Speaking broadly, an important factor regarding stock quality is the question of oxidation preliminary to contacting. It has been quite generally established that stocks subjected to oxidation are more difficult to contact than others. This is demonstrated in the following tests:

EFFECT OF COOLING AND PREOXIDATION ON CONTACT-CLAY EFFICIENCY

Stocks contacted at 500 Deg. F—	Pounds of clay per gallon	Filtered-oil color (Tag-Robinson)
Pennsylvania cylinder stock (cooled and exposed to air)	2.5	2¾
Pennsylvania cylinder stock (contacted direct without cooling)	1.5	2⅜
Pennsylvania cylinder stock (contacted direct after 8 hours' standing without cooling)	1.5	2¾

The contacting of lubricating stocks immediately subsequent to fractional distillation and without cooling is covered by patent No. 2,045,160,[7] it being

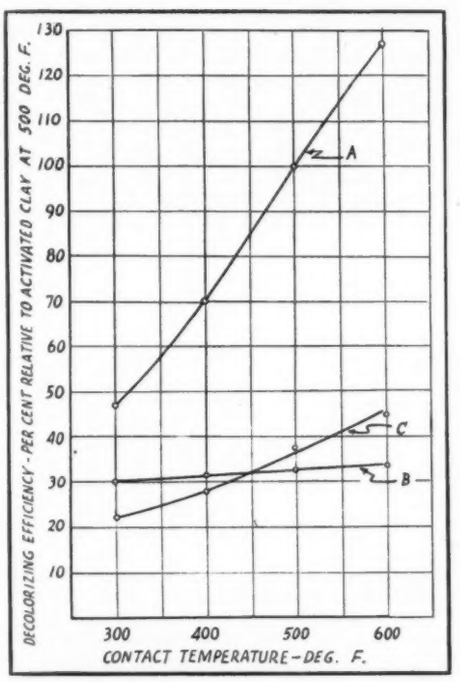


Fig. 7—Effect of temperature on decolorization; contacting lubricating oil for 20 min.

Legend
A—Domestic activated clay
B—Domestic natural clay "B"
C—Domestic natural clay "C"

claimed that a reduction in clay requirements of from 25 to 50 per cent may be realized by following this procedure.

Other factors in the determination of optimum conditions for contacting at the boiling range are the open-cup flash, viscosity, and viscosity index of the oil. Oils of higher viscosity require more severe contact treatment to obtain maximum decolorization than do oils of lower viscosity. It has been established that, in order to obtain optimum contacting results within practical time limits, it is necessary to reduce the body of the oil to permit the function of the adsorbent to come fully into play. Fig. 10 shows the relation between the viscosity of oil and time of contacting when contacting to maximum decolorization. For example, referring to Fig. 10, an oil having a Saybolt viscosity of 2,000 at 100 deg. F. required 10 units of time, and a 625-viscosity oil from the same crude source required only 2 units of time. Of interest in connection with viscosity reduction is a recent article on this subject by Wilson, Keith, and Haylett,[8] wherein a cylinder stock in propane solution is contacted at 160 deg. with resultant improved clay efficiency of 300 to 400 per cent. Direct quotation from this paper follows:

"The residual (Mid-Continent) was produced by deasphaltizing to 82½ per cent yield as shown in Fig. 12. Using only 10 lb. 95-per-cent acid, it was possible to produce, with the addition of 0.46 lb. filtrol per gallon of oil, a finished lubricating stock with a Tag-Robinson color of 3½, a Conradson carbon of 1½, and a viscosity of 122 at 210 deg. F."

An explanation given for the relatively high efficiency of contact clay obtained at low temperatures is that propane is acting as a preferential precipitant throughout the bodies which the clay will selectively remove. It seems obvious that the diluent effect of the propane furnishes at least part of the mechanism through which the well-known increased efficiency for bleaching clays at high temperatures is obtained.

In establishing the optimum contacting temperature for various viscosities, it has been customary to use the Cleveland open-cup flash test as indicative of the practical limits for top contacting temperature. While this procedure is not altogether satisfactory and, certainly, subject to considerable variation, depending upon the nature of the stock, it has proved to be simple and quite effective in actual use. The open-cup flash test of an oil is readily obtained, and serves quite satisfactorily in the nature of a fixed point from which actual top contacting temperature may be established.

Equipment Improvements and Operating Technique

The majority of domestic contact plants were installed during the period 1924 to 1930. In some instances the equipment used in these plants was from other portions of the refinery, and not entirely suitable for the new duties. Recent studies as to the use of contact clays have resulted in numerous improvements (see Fig. 5).

Clay Handling. Simplification of this portion of the contact plant is being accomplished by discharge of the clay at the railroad siding into a portable hopper from which a screw conveyor transfers the material to tank storage and thence to an automatic weighing machine. Inasmuch as the entire system described is enclosed, the dust nuisance is eliminated. Incidentally, reduction in and elimination of storage space and handling of bags result in considerable saving.

Mixing Equipment. More recent opinion as regards mixing seems to be directed to decreasing greatly the size of this equipment, where formerly mixing tanks were used having capacities of 50 bbl. to 200 bbl. and/or employing mechanical mixing circulation. The use of automatic weighing machines for the clay permits continuous mixing equipment of relatively small volume capacity, i.e., 2 bbl. to 20 bbl. Continuous and intimate mixing of the clay and oil is effected during its passage through this type of equipment and charging pumps. Proper temperature of the oil for mixing should be arrived at by laboratory test. In cases where it would be unwise to pass the entire oil feed through the mixer, a satisfactory arrangement has been obtained by by-passing the greater part of the feed and employing the mixer simply as a means of making slurry, which is then directed back to the suction of the pipe-still charging pump with the main stream.

Heater and Flash Tower (i.e., Time and Temperature of Contacting). The time and temperature relation is to some extent interchangeable in arriving at the optimum condition for contacting petroleum oils. In order to establish these factors properly, it is best that laboratory tests be carried out individually for the

specific type of oil and adsorbent under consideration. By temperature of contact is meant the top temperature reached at the outlet of the coil heater, since this temperature has been found largely to measure the decolorizing value of the clay. In actual plant and laboratory practice, the temperature is brought to maximum under more or less constant rate of temperature rise. The time

Fig. 8—Sweetland filter-press installation

to obtain maximum temperature ranges from 5 min. to 15 min. The maximum temperature of contacted oil at the heater outlet may be from 300 to 450 deg. F. for light lubricants and from 450 to 650 deg. F. for the heavy lubricants, depending upon conditions. Mid Continent cylinder oils are generally contacted at about 450 to 550 deg. F., whereas Pennsylvania cylinder oils of the same viscosity are contacted at 500 to 600 deg. F. These temperatures are considerably higher than were used some years ago, and have resulted in decreased clay usage.

The upper temperature limits in these cases cannot safely be maintained from the standpoint of product quality or overhead degradation loss without due consideration of the heater construction, the contact-time factor, and the removal at the top temperature from the contacted oil of the moisture and reaction products resulting from the contacting.

While this conclusion has in part been recognized by the industry for a number of years, equipment facilities up until recently have not been such as to demonstrate its real value. In the past the object has been accomplished in part by the introduction of open steam into the heater and/or the introduction of steam into the soaker or flash tower following the heater. Due to poor design of the stripping equipment, this procedure has been none too efficient.

In commercial application of contacting, time beyond one hour does not appear justified and, for the most part, it seems evident that optimum conditions are obtained when using the minimum contacting time required for efficient stripping of the oil after it has reached top contacting temperature. The term "contacting time" in this article is taken as the number of minutes the oil is held at or near the top temperature in the flash tower preliminary to cooling for filtration. Under no circumstances does it appear desirable to re-cycle the oil from heater to flash tower for the purpose of maintaining temperature, since such practice results in over-treating some portion of the oil.

The preferred heating and contacting procedure, as indicated in Fig. 5, is made possible by pipe stills of improved design provided with automatic control and designed for oil velocities of from 5 to 10 ft. per sec. The improved type of vacuum stripper immediately following the pipe heater consists of a flash tower of sufficient capacity to give a maximum contact time of one hour with float control for variations down to 5 min. The tower should contain several bubble plates in the top section for effective stripping action. The hot oil from the pipe stills enters this tower on one of the bubble plates. Steam may be introduced into the bottom section as desired. In general, it will not be found necessary to use more than ½ lb. of steam per gallon of oil. Vacuum of from 23 in. to 28 in. should be provided, and may be economically accomplished by means of a barometric condenser equipped with ejectors. A photograph (Fig. 6) of a recent installation of pipe-still equipment and vacuum stripper tower is presented herewith. The quality of oil produced with such equipment has been found to be fully satisfactory. Some idea as to the savings effected by operating in the higher temperature range may be obtained by reference to Fig. 7. Of special interest in this figure is the relative higher efficiency for the activated clays with increasing contact temperatures.

Filter (i.e., Oil-Clay Separation). As indicated in Fig. 5, the oil-clay mixture from the tower is immediately cooled and conveyed to surge tank and primary filter press for separation of oil and clay. Following the primary filter, final traces of fine clay are removed by means of a blotter press. An installation of such equipment is shown in Fig. 8 and 9. The efficiency and capacity of filtering equipment have been improved by filtering the heavier oils at higher temperatures of 275 to 350 deg. F. and employing clays of higher filterability. Clay-cake thickness of 1½ in. is not unusual (i.e., equivalent to 4.5 to 7.5 lb. of clay per square foot of filter area). The clay capacity of the filter and the pounds of oil put through the filter per cycle, together with the time required per cycle and number of cycles, determine the operating capacity of the filter per day. Useful data for calculating filter capacities are given in Table 5. While there have been no changes in the filter equipment proper within the last few years, experimental work is now under way using continuous Oliver United pre-coat filters, which if successful, will result in reduced cost.

The removal of oil from clay cake in the Sweetland filter by means of naphtha washing is used to advantage in some refineries. The amount of naphtha required to wash oil from filter cake runs from 0.25 gal. to 0.5 gal. per pound of clay used, and the whole washing time and airing period aggregates 10 min. to 20 min. The usual oil content of contact clays in cylinder-stock service following air blowing is from 30 to 35 per cent by weight. Naphtha washing of the cake followed by blowing with inert gas reduces this figure to 1 to 5 per cent.

Research in the field of clay revivification is under way, but without evidence of immediate practical application.

A means of reducing the cost of bleaching clays is the re-use of the clay cake (without washing) in preliminary stages of refining where contacting at higher temperatures than in the finishing stage. The justification for this procedure appears to be in the theory that the unused portion of effective adsorbent between lower and higher contacting temperature is salvaged.

In summarizing, it may be said that the overall result of the improvements in the past few years has been a marked simplification of the contacting process to give lower labor, material, and plant-installation costs on the basis of finished production of lubricants.

Economic Analysis of Contact-Clay Processing

Lubricating Stocks. The modifications and improvements heretofore discussed in the use of contact clays on lubricating stocks have increased the efficiency of this process to a point permitting maximum operating economy, together with a yield of higher-grade product than previously obtained. By way of comparison, the following points are of interest:

Lower Equipment Costs and Greater Throughput. A recent contact plant having 600 bbl.-per-day charging capacity was installed at a contracted cost of $80,000 complete. It is estimated that a similar plant, but with 1,000-bbl.-per-day capacity, could have been installed at approximately $100,000 complete. In the earliest stages of contact filtration a plant of the latter capacity would have cost about $200,000 complete.

Continuous Operation. The improved-type plant is designed substantially for continuous operation. Intermediate storage capacity is small and, hence, rapid changes in the type of stock contacted can be accomplished. The improved-type plant should require no more than two men per shift as against three to six men for the older-

(Continued on Page 71)

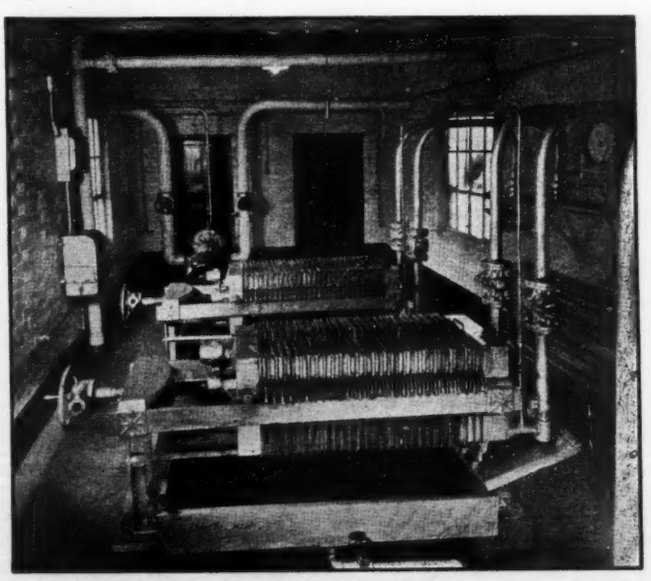
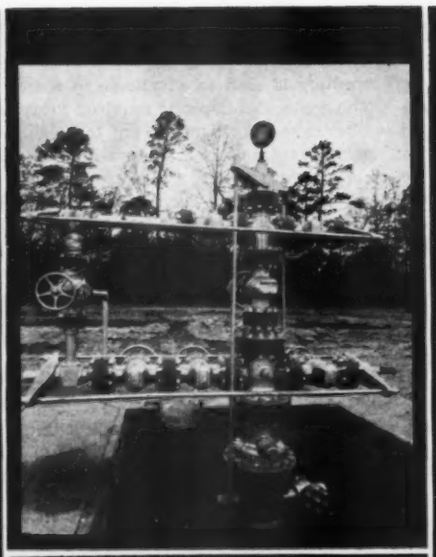
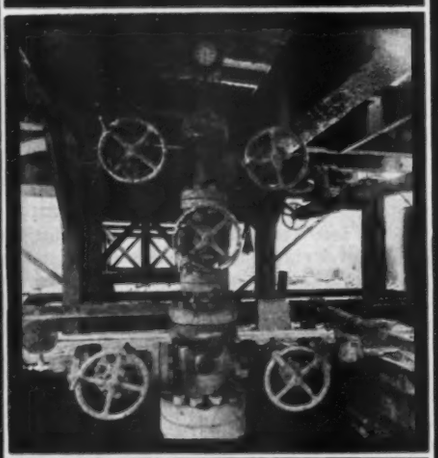
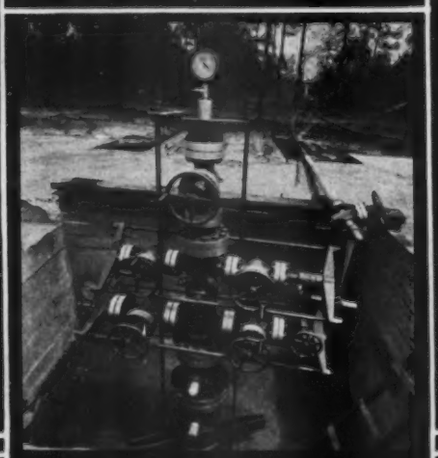


Fig. 9—Blotter-press installation







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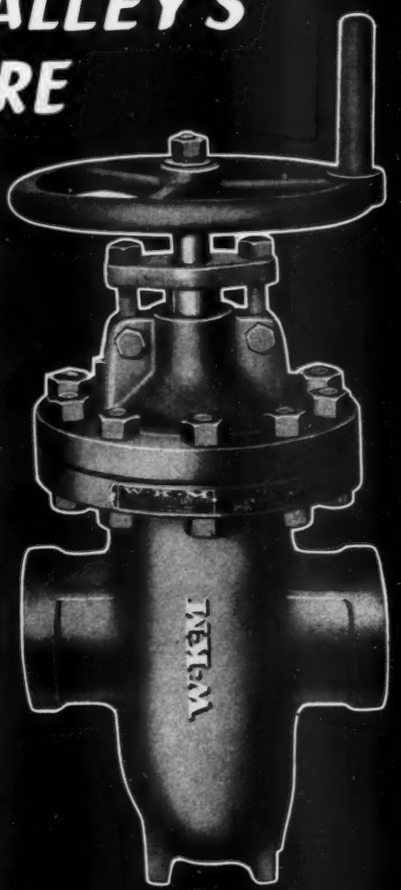

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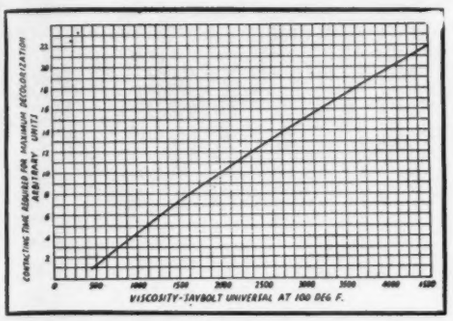
CONTACTING TIME REQUIRED FOR MAXIMUM DECOLORIZATION AT FIXED TEMPERATURE AND CLAY RATE
VISCOSITY-SAYBOLT UNIVERSAL AT 100 DEG. F.

Fig. 10—Relationship between oil viscosity and time required for maximum decolorization at fixed temperature and clay rate

type of clay and charging stock have contributed to greatly reduced clay consumption and increased yields of a higher-quality product. Reduction of clay requirements to 50 per cent of previous averages has been accomplished in some instances.

Lower Manufacturing Costs. An outstanding point in favor of contacting is its simplicity. The process permits rapid and accurate cost analysis. In making such analysis three main items in cost must be considered, viz.:

a. Direct operating costs: Calculations have been made to show comparative operating costs for one of the older-type contact plants (Table 6) against the more modern plant (Table 7). It will be noted that the total direct costs, excluding clay and oil, in the former case are $.00377 per gallon of charge compared to $.00237 in the latter case.

b. Clay costs: Clay costs per gallon of charge may be readily calculated by substitution in the formula:

$$\frac{C}{2{,}000 \text{ lb.}} E = \text{cost per gallon of charge}$$

(*where* C = cost of clay in dollars per ton, and E = pounds of clay used per gallon of charge.

A typical example follows:
C = $50 per ton
E = 0.4 lb.

Thus clay cost per gallon of charge $= \frac{50}{2{,}000} 0.4 = \$.01$.

c. Yield: In order to arrive at actual cost of product for comparative purposes, the yield must be obtained. Plant yields are sometimes difficult to correlate to specific conditions of clay usage. Hence, in addition to the usual plant accounting methods, it is well to make a periodic laboratory search of oil losses to clay by the method outlined in Table 4. This test may readily be applied to

TABLE 5—GENERAL DATA—STANDARD SWEETLAND FILTERS

Filter numbers		1	2	5	7	10	12
Inside diameter (inches)		10	16	25	25	31	37
Inside length (inches)		20½	36½	61	82	109	145
Filter-leaf spacing, 2 inches	Number of leaves	9	18	30	41	54	72
	Filter area in square feet:						
	Smooth rim	8	46	185	252	523	1,003
	Grooved rim	7.5	42	175	239	500	965
	Maximum cake capacity in cubic feet, with ½-in. cake	0.3	2	8	11	22	42
Filter-leaf spacing, 3 inches	Number of leaves	7	12	20	27	36	48
	Filter area in square feet:						
	Smooth rim	6	31	123	166	349	670
	Grooved rim	5.7	28	117	158	333	642
	Maximum cake capacity in cubic feet, with 1-in. cake	0.5	2.5	10	14	28	56
Filter-leaf spacing, 4 inches	Number of leaves	5	9	15	20	27	36
	Filter area in square feet:						
	Smooth rim	4.5	23	92	123	262	502
	Grooved rim	4	21	88	117	250	483
	Maximum cake capacity in cubic feet, with 1½-in. cake	0.6	3	12	15	33	63
Total weight of filter filled with water (lbs.)		550	2,150	7,300	9,350	16,500	29,600

TABLE 6—STANDARD ORGANIZATION EXPENSE SCHEDULE

(Plant Capacity—1,000 50-Gallon Barrels Per Day)
Refinery (Lubricating) Department (Contacting) Unit

Account Name	Position	Split (Per Cent)	No. of Men	How Paid	Shift or Day	Plant Hours in Standard Month	Material Unit	Standard No. of Units in Standard Month, 657	Price or Rate	Standard Costs Per Standard Month: Fixed	Variable
Position and Non-Position Labor:											
	Foreman	25	1	Month	Day	730	....	....	at $1.00 per hour	$75.00	.....
	No. 1 operator	100	3	Shift		730	....	....	at 1.00 per hour	730.00	.....
	No. 2 operator	100	3	Shift		730	....	....	at .75 per hour	547.50	.....
	Heavy laborer	100	1		Day	156	....	....	at .60 per hour	93.60	.....
									Total labor	$1,446.10	.....
General Expense:											
	Repairs (5 per cent times $100,000)									416.00	.....
	Power, 2,666 kwh. at $.015 per kilowatt hour									40.00	.....
	Steam, 100,000 lb. at $.30 per thousand pounds									30.00	.....
									Total expense	486.00	.....
									Grand total	1,932.10	....
									Dollars per plant hour	2.94	.....
									Dollars per gallon of charge	.00127	.....
Variable Items Dependent Upon Throughput:											
	Fuel at 1 gal. per 50 gal. at 3 cents per gallon of charge										$.0006
	Steam at 1 lb. per gal. at 30 cents per thousand pounds										.0003
	Power at 0.65 kwh. at 1.5 cents per kilowatt										.0001
	Miscellaneous										.0001
									Total variable		$.0011 per gallon of charge
									Total fixed and variable		$.00237 per gallon of charge

Plant time efficiency—90 per cent (730 lb. times 0.9 equals 657 hours per month.)

TABLE 7—STANDARD ORGANIZATION AND EXPENSE SCHEDULE

(Plant Capacity—1,000 50-Gallon Barrels Per Day)
Refinery (Lubricating) Department (Contacting) Unit

Account Name	Position	Split (Per Cent)	No. of Men	Plant Hours in Standard Month	Material Unit	Standard No. of Units in Standard Month, 657	Price or Rate	Standard Costs Per Standard Month: Fixed	Variable
Position and Non-position Labor:									
	No. 1 foreman	50	1	730	....	....	$300.00 per month	$150.00	.....
	Shift foreman	100	3	730	....	....	1.00 per hour	730.00	.....
	Shift stillman	100	3	730	....	....	.95 per hour	693.50	.....
	Shift mixer	100	3	730	....	....	.70 per hour	511.00	.....
	Shift pressman	100	3	730	....	....	.75 per hour	547.50	.....
	Heavy laborer	100	1	156	....	....	.55 per hour	85.80	.....
							Total labor	$2,717.80	.....
General Expense:									
	Repairs (investment, $250,000 at 5 per cent)							1,041.68	.....
	Power, 6,100 kwh. at $.015 per kilowatt hour							91.50	.....
	Steam, 210,000 lb. at $.30 per thousand pounds							63.00	.....
							Total expense	1,196.18	.....
							Grand total	3,913.98	.....
							Dollars per plant hour	5.95	.....
							Dollars per gallon of charge	.00257	.....
Variable Items Dependent Upon Throughput:									
	Fuel at 0.8 gal. per 50 gal. at 3 cents per gallon of charge								$.00048
	Steam								.00060
	Power								.00012
							Total variable		$.00120 per gallon of charge
							Total fixed and variable		.00377 per gallon of charge

Plant time efficiency—90 per cent (730 hours times 0.9 equals 657 hours per month.)

Process Requirements—Variable
Steam = 2 lb. per gallon
Fuel = 0.8 gal. per 50 gal.

actual practice by means of the following formulas:

$$\text{Yield of contacted oil} = \frac{A - (RG)\,100}{A} \quad \text{(formula F)}$$

(*where* A = gallons of oil charge; R = total oil retention on clay-charge basis; and G = pounds of clay used).

Example:

$A = 100$ gal. (750 lb.)
$R = 50$ per cent.
$G = 0.4$ lb. per gal. (40 lb.).

$$\text{Thus yield of contacted oil} = \frac{750 - (0.5 \cdot 40)100}{750}$$

= 97.4 per cent. Overhead loss, or degradation, if any, is not included in the above figure. Where oil is recovered from the filter cake, the same general formula may be used, but as follows:

$$\text{Yield of contacted oil} = \frac{A - [(R - Y)G]100}{A} \quad \text{(formula F-1)}$$

where: Y = recoverable oil (see Table 4).

Example:

Conditions same as without recovery, but Y = 30 per cent.

$$\text{Thus yield of contact oil} = \frac{750 - [(0.5 - 0.3)40]100}{750} = 98.9 \text{ per cent.}$$

Yields obtained in the above manner will be useful in arriving at both operating and material costs—the latter including clay, oil soakage, etc.

Summary

The following is believed to be a conservative comparison of typical oil and modern lubricating contact costs:

	Old (Dollars Per Gallon of Charge)	New (Dollars Per Gallon of Charge)
Operating costs (Tables 6 and 7)	$.00377	$.00237
Clay costs*:		
Old, at 0.6 lb. per gal. at $52 per ton	.01560	
New, at 0.4 lb. per gal. at $52 per ton		.01040
Total	$.01937	$.01277

*Activated clay.

In placing the foregoing cost on a finished-oil basis, yields may be obtained by substituting in formula (F), assuming 8 cents charging-stock value, as follows:

	Old (Dollars Per Gallon of Yield)	New (Dollars Per Gallon of Yield)	Net Advantage for New (Dollars Per Gallon of Yield)
Operating and clay cost . 96.0	$.0202	.....	.....
Operating and clay cost . 97.4	.....	$.0131	$.0071
Material cost at 8 cents .. 96.0	.0834	.....	.....
Material cost at 8 cents .. 97.4	.....	.0822	.....
Total cost	$.1036	$.0953	$.0083

Where clay soakage is recovered, formula (F-1) is used instead of formula (F) and, in addition, cost of recovering shown as a debit.

Motor Fuels

The foregoing discussion is confined to handling lubricating stocks and specialties. There is an increasing demand for contact clays, brought about by the various new processes in motor-fuel manufacture. Attention in the past few years has been especially directed to production and maintenance of high octane number, low gum content, and stability. Both activated and natural contact clays have been applied successfully on various types of vapor- and liquid-phase cracked distillates. In the new field of gas polymerization the use of activated clays as catalyst carriers and catalysts are demanding considerable attention. Various patents refer to the merits of this type of material for such purposes, and it seems quite likely that contact clays of the activated type will be in demand for this phase of petroleum refining.

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Use of Gas-Lift and Flow Valves in the East Texas Field

By RILEY A. AUCOIN
Humble Oil & Refining Co.

Gas-lift and the functions of pressure and pressure differentials have been known to the oil industry for many years. This is evidenced by the fact that many patents pertaining to gas-lift date back as far as 1910, and some were issued prior to that time. Engineers of the earlier days thought of gas-life as a force which would

Riley A. Aucoin, Humble Oil & Refining Co.

cause the oil level to drop in the annular space between the tubing and casing when such force was applied between the tubing and casing at the wellhead, causing the fluid to rise inside the tubing and to be produced in the same manner as natural-flowing production. In such cases, of course, comparatively high input pressures were necessary. No thought was given at that time to bottom-hole pressures or the effects of the gas-lift pressures upon the main reservoir. Then came the special "foot pieces" or attachments for the tubing with which various lengths of tubing strings could be run and the wells made to flow with lower casing pressures and fairly good mixtures of gas and oil. The length of tubing strings were of course dependent upon the working fluid level in the wells, and no thought was given to large gas volumes.

The so-called "flow valves" began to make their appearances previous to 1930, but were at that time considered only a transition stage between flowing and pumping. Not until 1933 was any serious consideration given to the possibility of carrying producing wells to depletion with flow valves, or the intermission of controlled gas at various levels in tubing strings.

The great East Texas field presents one of the most interesting gas-lift prospects known to aspirants of this form of oil production. By the time this field was started, engineers had learned that complete well records were essential to solve problems which would be presented later in the life of the wells. Consequently, sand conditions and bottom-hole pressures were recorded during the first well completions, and extended to the present time. With a knowledge of permeabilities and porosities or the productivity of the sand, which gives drop in bottom-hole pressure under flowing conditions, together with a knowledge of the weight of a given column of the crude, the gas-lift engineers have only to search for equipment to meet each well's conditions. These engineers also have many other conditions favorable to this form of production. The wells are of medium depth, and

***A.P.I.*—Presented before the East Texas Division of Production, Kilgore, Texas, May 25**

the short lengths of lift permit induction of gas of lesser volume per barrel of fluid produced and at low pressures where slippage is reduced because of the lower pressures and greater velocities. This reduces paraffin accumulations which have always troubled operators when artificial-lift equipment is used in fields producing light paraffin-base oils.

With such a wealth of available information in store, it is only natural that some of the engineers would think of gas-lift as a means of producing wells in this field, but all were at first hesitant to make such recommendations.

When one of the major companies started gas-lift attempts in the East Texas field, in March of 1933, many thought this would be only another noble experiment. The old conventional "straight gas-lift" was first tried, with attempts to produce a given quantity of oil (under proration) with a maximum of 300 pounds pressure. It was soon found that when the tubing was submerged to a depth great enough to produce the given quantity of oil, fluctuating fluid levels would cause the wells to become "fluid bound" at intervals, and had to be swabbed onto production.

The use of smaller strings, 1¼-inch inside of 2½-inch tubing, and 1-inch inside of 2-inch tubing, with gas introduced between the two strings, and producing through the small string, met with the

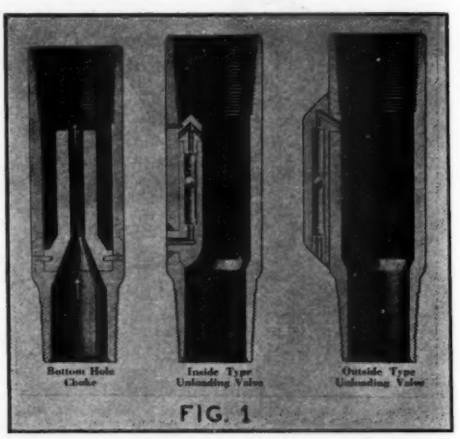


FIG. 1

same failure as the larger strings. Better success was obtained when small perforations were introduced into the small flow strings at various levels, but large volumes of gas were used, and paraffin accumulations soon made this practice prohibitive. Attention was then turned toward the possibilities of controlling the gas volumes admitted at the vari-

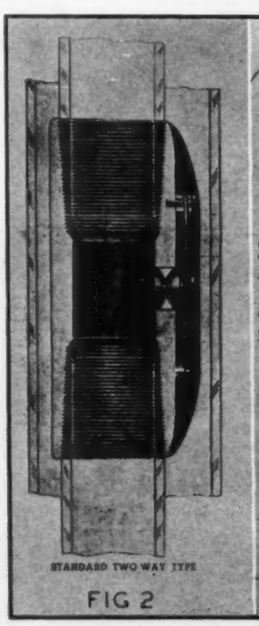


FIG 2

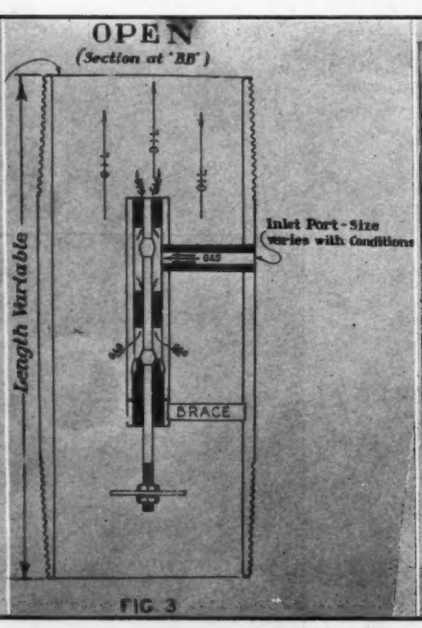


FIG 3

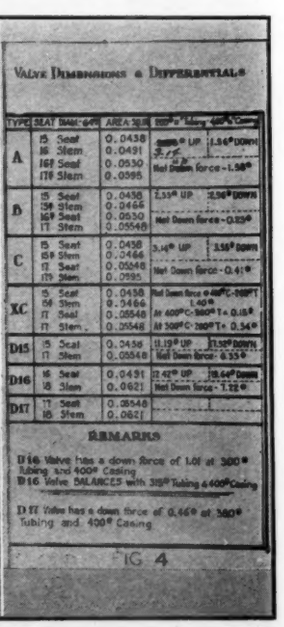
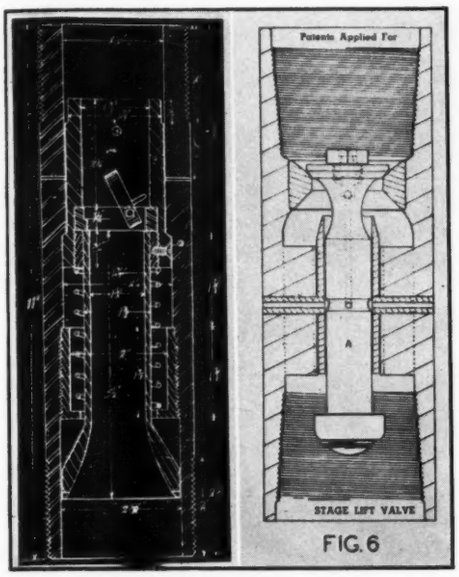


FIG 4

ous levels. This presented a problem for which there seemed at first to be no solution, but for which there has been development, at a rapid pace during the last few years; this leads to the real beginning of "flow valves in the East Texas field."



Figures 5 and 6

Kick-Off Valves

The first of these valves to make their appearances were the so-called kick-off valves, of which there were two predominate types, (Figure 1 and Figure 2) the "ball type" and the "side button type." The "ball type," Figure 1, consisted of a small ball in a tube with predetermined clearance, with ball seats at each end. This tube was fitted to the outside of a nipple, so that the lower end would be open to the casing gas, and the upper end opened into the tubing. These were spaced at distances of approximately 300 feet apart in the flow string. While the well remained shut in, the weight of the balls kept them on the lower seat. When the tubing was opened, the pressure immediately lowered inside the tubing thereby causing gas to move through each valve until a differential of approximately 20 to 30 pounds (can be varied with different clearance and ball weight or port sizes) was reached. The balls then sealed against the upper seats shutting off the casing gas at the point at which the valve was located. The upper valves reaching the pressure differential first, would therefore be the first to close and the valves would close in succession going downward in the well. This usually caused the fluid column to be sufficiently lightened to make the well continue to flow under its own pressure. After the balls of these valves seated against the upper seats, they would not open again until the pressures were almost equalized in the casing and tubing. This valve is referred to as Valve "A."

The "button type" kick-off valves, Figure 2, consisted of a semicircular steel button attached to a piece of flat spring steel, approximately 2½ inches long, and one-half inch wide. This steel spring was attached to a nipple at the one end, with the button on the other end. This button seated into a port in the side of the nipple. The spacing of these nipples in the tubing string was similar to the "ball type" valves. The springs of these valves served to keep the buttons away from their seats, thereby necessitating an opposing pressure differential across each valve before the casing gas would discontinue passing into the tubing column. The pressure differential at which these valves would open and close depended upon the tension in the springs and the port sizes. The cycle of operation of these valves is similar to the "ball type" valves. This valve is referred to as valve "B."

Inside Type Fluid Controlled Valves

There are many different valve makes which might come under this heading, but for the purpose of this paper we will consider only those tested extensively in the East Texas field.

The "C" inside type valve, Figure 3, consists of a small plunger with two seating enlargements and a flat disk on the lower end. This plunger fits into a small chamber with two seats ground to fit the seating enlargements of the stem, so as to make a balanced valve. This complete assembly is fitted inside of a nipple, with a port drilled through the nipple and connected to the tube, between the two valve seats. The disk is on the bottom side of the assembly. Spacing these valves at different levels in the flow string, and introducing gas into the annular space, will start movement of the fluid column inside the tubing. As this fluid passes the disk on the lower end of the valve stem, its velocity forces the stem upward against the two seats, shutting out the flow of casing gas. The velocity of the gas through the valve also assists in closing it.

When these valves were first used in East Texas, they were evenly spaced from the surface downward and all of the valves were identical. This type of setting produced very nicely at first, while fluid levels were high. The fluid levels then began to drop and excessive gas volumes resulted.

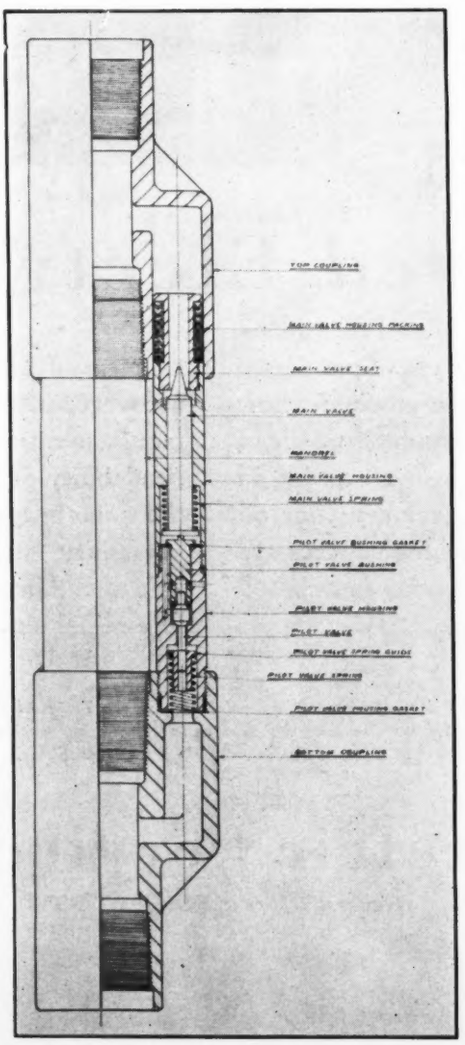
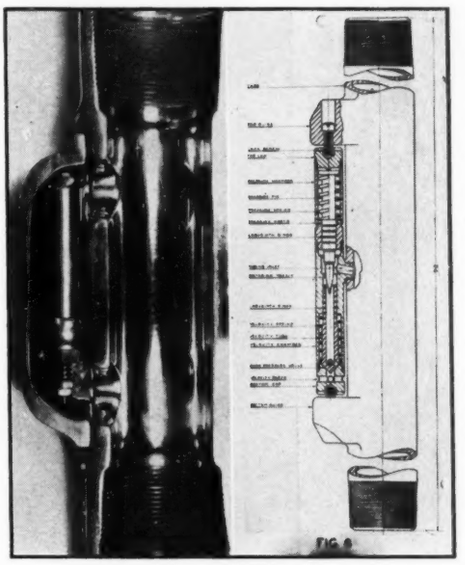


Figure 3

An attempt was then made to place the top valves at a greater distance from the surface without first determining the approximate static fluid level.



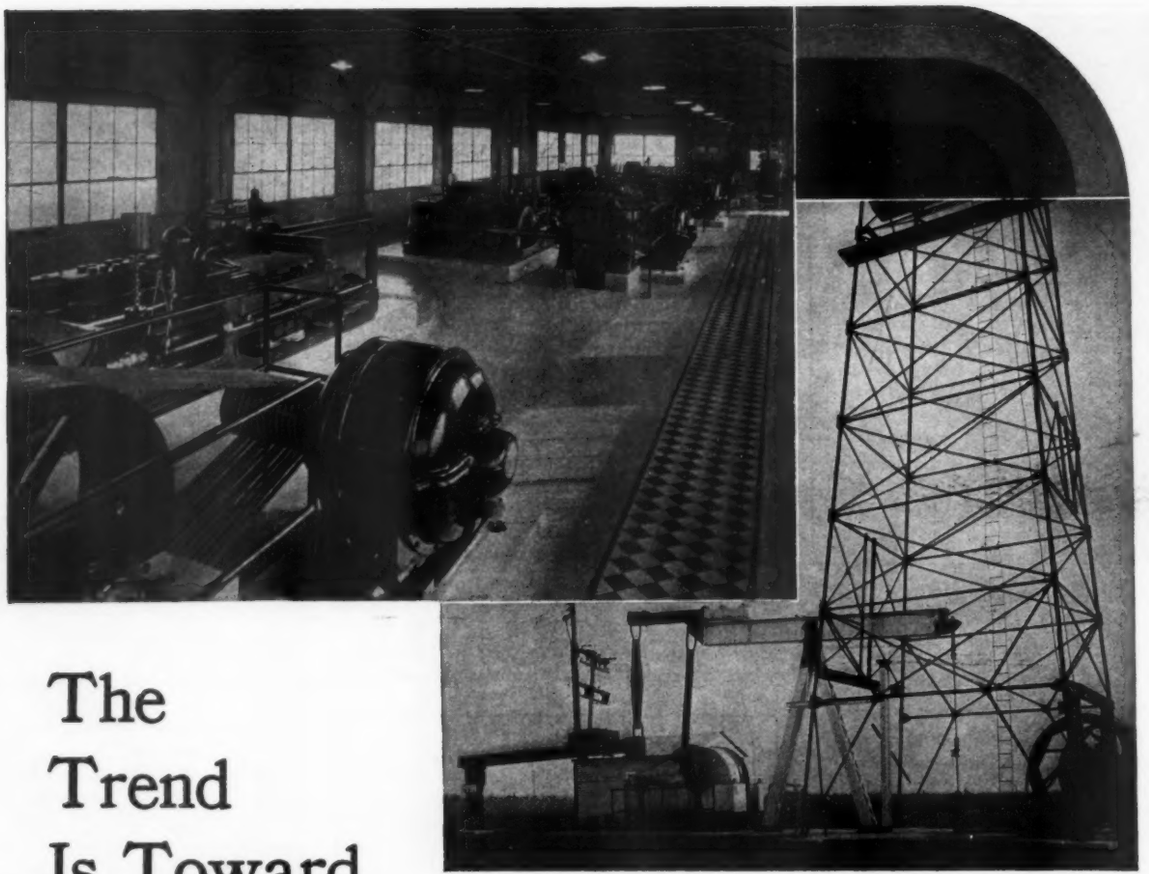
Figures 7 and 8

First attempts at this type of gas-lift flow proved failures, because the upper valves became too deeply covered with fluid. New developments on this type of valve, Figure 4, introduced a variety of different cross-sectional areas, with varying sizes of disks, so that all upper valves could be made to close more quickly, and the lower valves remain open longer. With the use of from 8 to 13 of the new type valves in each well, good results were obtained. Some of these settings remained in the wells more than two years, without being pulled.

The "D" valves, Figure 5, were introduced in East Texas at the time when wells started dropping rapidly in bottom-hole pressures, and many wells required frequent swabbing. This valve may be called a semistage lift valve. It consists of a nipple which serves as a tubing attachment, and a sleeve for the fluid actuated sliding mechanism inside. The inside mechanism consists of close fitting hollow plunger with a venturi tube in the lower end, and a flapper check valve in the upper end. The upper end of the plunger is recessed so that gas may pass in through a port when the inside mechanism reaches its lower seat. As fluid passes through the valve, the plunger is forced upward against a seat and the ports are closed. Whenever the movement of the fluid stops in the tubing the plunger drops downward and the check valve stops the downward movement or slippage of the fluid. At this time the ports are opened and gas is permitted to pass up through the oil to lighten it and cause movement, thereby forcing the plunger upward.

These valves were at first spaced evenly in tubing strings, as in the case of all early valve settings, but it later developed that better success could be obtained by spacing the valves nearer each other in the working fluid levels, and increasing the valve distances above and below the working levels. Some of the settings of these valves performed satisfactorily for more than two years.

The "E" valves, Figure 6, consist of a close-fitting plunger in a heavy casting. The plunger has a hollow center, fitted with a small ball check valve in the upper end, and has small holes from the center hole into a recess around the close fit between the casting and plunger. Gas ports drilled through the casting fit perfectly into the plunger recess when the plunger is in its lower position,



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thereby permitting gas to pass from the casing to the center of the plunger and into the tubing column. The plunger has an enlargement at the upper end which seats and prevents fluid from dropping

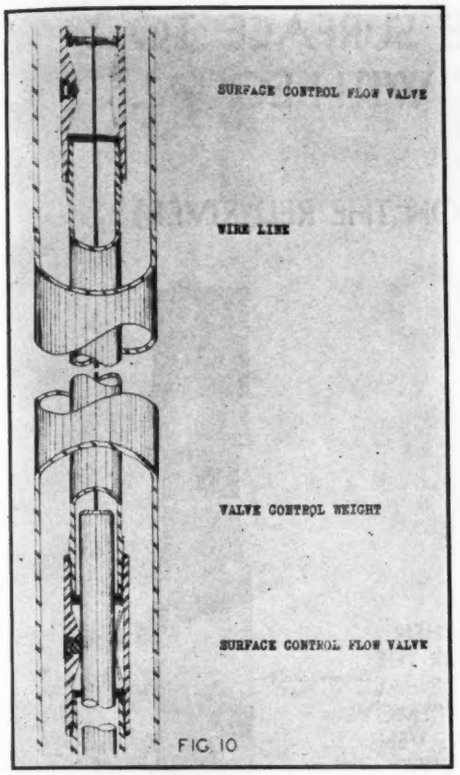

FIG. 10

downward when fluid upward motion stops. Fluid passing through the valve forces the plunger upward and closes the gas ports. Best results with this valve were obtained with spacings of approximately 300 feet between valves and when using from 8 to 10 valves per well. This valve gives better results in high fluid level wells.

Outside Type Spring Controlled Valves

Valves under this heading are the latest developments of flow valves. At the present time only three makes of these valves are being used in this pool. These are referred to as "F," "G" and "H." The most important advantage of these valves is having an opening so that a swab or paraffin scraper may pass through. Bottom-hole pressure readings may also be taken when using these valves. The "F" valves, Figure 7, are similar in construction to the inside type "C" valves. The main stem has a larger seating head than the inside type valve, and a spring, with lock-nuts, replaces the flat button of the opposite end of the stem. This small tube surrounds the stem as on the inside type, and is identical in construction, but this tube is attached to a concave plate with the port extending through this plate. This plate with valve attachment is then bolted with capscrews to the main tubular casting. Special gaskets are placed and cemented between the main body and the valve plate to prevent leakage.

The operation of this valve is based upon pressure differential for opening and gas velocity for closing. The variables of this valve to meet well conditions are, clearance between the enlargement of the valve stem and the surrounding tube; sizes of inlet and outlet ports; stem travel, and spring tension. With such a large number of variables to work with, almost any desired opening and closing pressures can be obtained. Therefore, these valves are constructed, as ordered, to meet individual well requirements. With 300 pounds available pressure and a static fluid level of approximately 2,400 feet from the surface, with zero pounds at the surface, the writer has had very good success with these valves set to open 100 pounds under the casing pressure and close with a differential pressure of 50 pounds, when spaced approximately 250 feet apart, from the packer upward, with the top valve at approximately 2,300 feet from the surface. This is given as an example for one well setting, and will be further explained later in this paper. Many other settings have been successfully used, including the use of these valves as intermitters, as will be discussed later.

The construction of the "G" valve, Figure 8, is considerably different from the last mentioned valve, but is similar, in that it depends for its actions upon differential pressures and gas velocities. This valve has a long cylindrical tube inclosing a close fitting velocity tube, held open with a spring, and a metering pin, also held in opened position by a spring. The cylindrical tube is attached to a special tubing nipple with projections or valve supports welded on each end. Small holes at the end of the cylindrical tube enclosing the velocity tube, admits casing gas, which passes through the velocity tube into the tubing nipple. Holes at the opposite end of the cylindrical tube admits gas pressure to the base of the metering pin. The action of the valve depends upon the velocity of the gas passing through the velocity tube which forces it toward a seat, thereby compressing the spring supporting it. After the velocity tube is seated, the metering pin with a tapered point moves into the hole in the velocity tube, thereby compressing its spring until the pin seats into the velocity tube. At this position, gas cannot flow through the valve. When pressure inside of the tubing nipple reaches a predetermined point (governed by cross-sectional area of the pin seat against the velocity tube and the tension of the spring on the pin), with respect to the pressure outside of the valve, the pin leaves its seat on the velocity tube, admitting gas, and completing the cycle. This valve also has a number of variables to permit different settings to meet well conditions. A few of these are: various tapers on the metering pin; different tensions of springs for both the metering pin and velocity tube, and varying lengths of velocity tube shoulders, or velocity tube travel.

Very good success has been had with various settings of this valve.

The "H" valve, Figure 9, is based upon a pilot control valve in connection with the main valve, controlling the inlet gas. It consists of a cylindrical tube with ports in one end, and in the center, surrounding a close fitting pin with a tapered end, its seat, and a small stem with a center enlargement on each side of which is a ground seat. The last mentioned part of the valve, known as the pilot valve, is spring balanced, and controls the action of the main valve.

The cylindrical tube enclosing the valve mech-

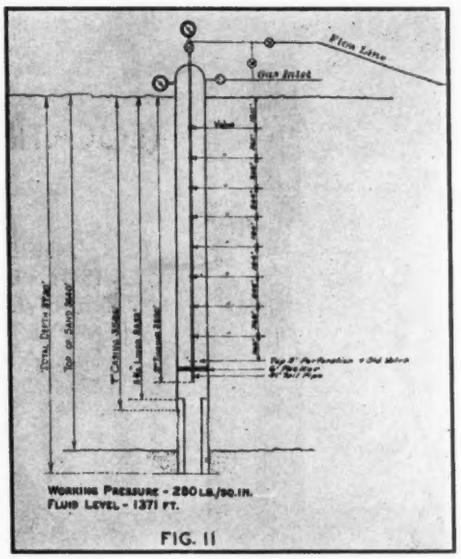

FIG. 11

anism is attached to two lugs, welded to a tubing nipple. Each lug has a port connecting with the valve mechanism.

This valve depends for its action upon the difference in pressure between the casing and tubing, for both opening and closing.

Assuming that the valve is in a closed position, the action of the valve might be outlined as follows: The casing pressure, by means of center ports in the cylindrical tube, acts upon the cross-sectional area of one of the pilot valve seats, thereby compressing the pilot valve spring. At the same time, the same pressure acts upon the base of the pin, compressing the spring supporting the pin, and keeping the pin tightly sealed in its seat, shutting off the upper port in the cylindrical tube. When the pressure on the inside of the tubing nipple reaches a predetermined amount, it forces the pilot valve from the lower seat into the upper seat, thus shutting the center ports of the cylindrical tube. When this is done, the pressure, which had been

(Continued on Page 82)

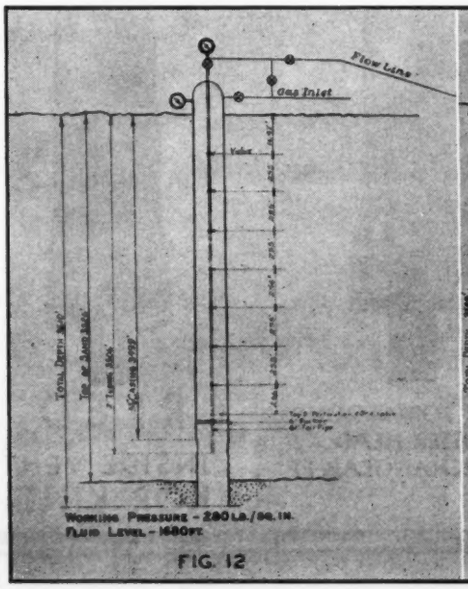

FIG. 12

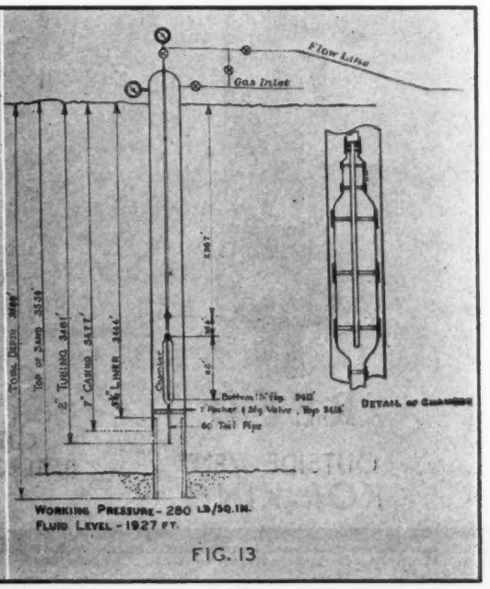

FIG. 13

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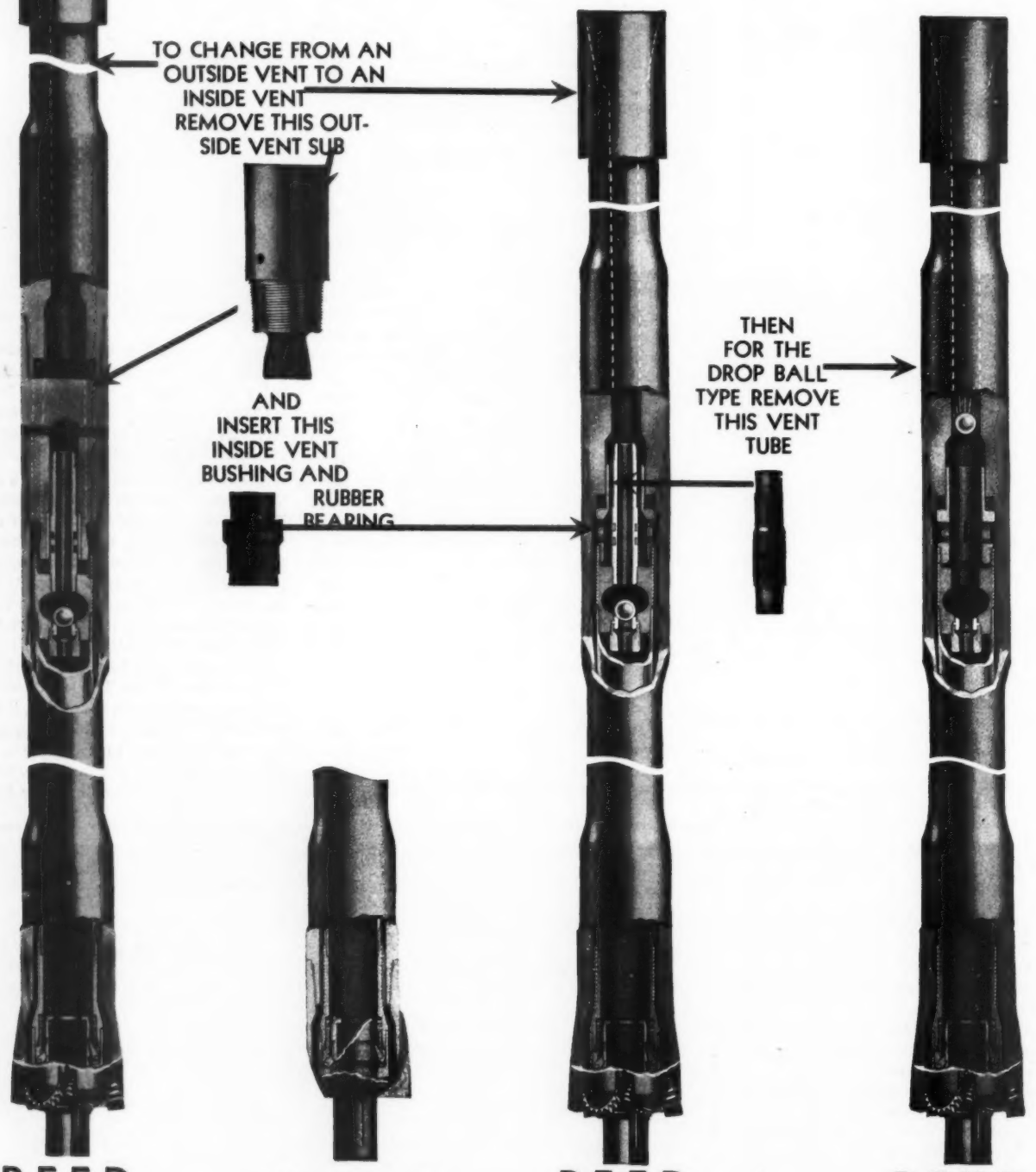
TO CHANGE FROM AN OUTSIDE VENT TO AN INSIDE VENT REMOVE THIS OUT-SIDE VENT SUB
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THEN FOR THE DROP BALL TYPE REMOVE THIS VENT TUBE

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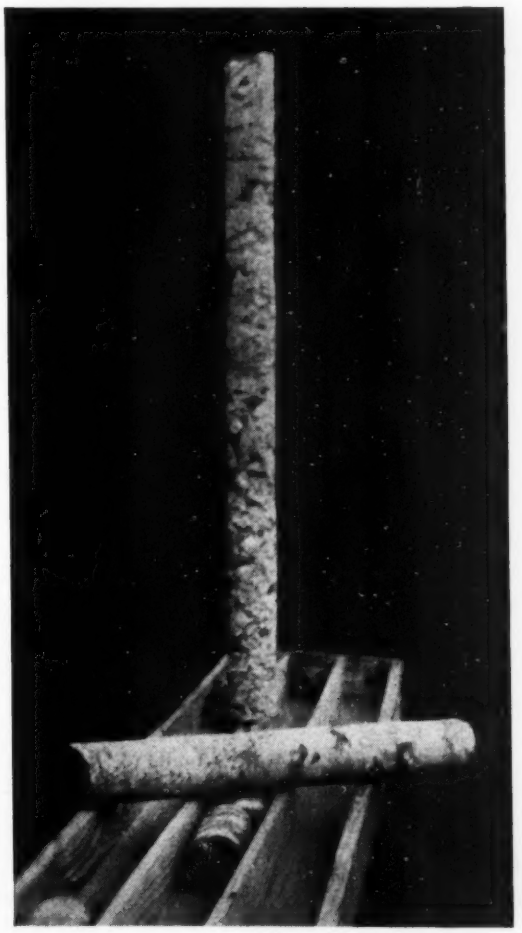

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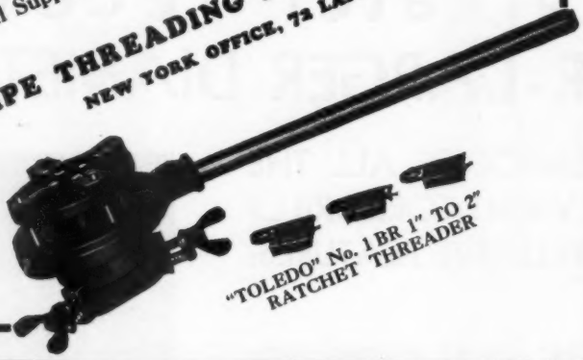

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trapped and acting against the pin, is released into the tubing. This causes the pin to leave the seat and admits casing gas through the upper port in the cylindrical tube into the tubing nipple. As the pressure drops in the tubing nipple, the pilot valve is forced to the lower seat, forcing the casing pressure against the lower end of the pin, forcing the pin into the upper seat, and shutting off the casing gas from the tubing nipple. This completes the cycle.

There are variables in this valve, which enables it to be set to meet individual well requirements. A few of these variables are: Port sizes, spring tensions and seat diameters.

This valve has just recently been introduced into the East Texas field.

Mechanical or Wire Line Operated Valve

This valve, Figure 10, consists of a tubular casting, with an enlarged wall thickness in the center, bored to support a ball. When inserted into position, this ball projects slightly into the inner side of the casting, and is kept in the socket by a port bushing, screwed into place from the outside

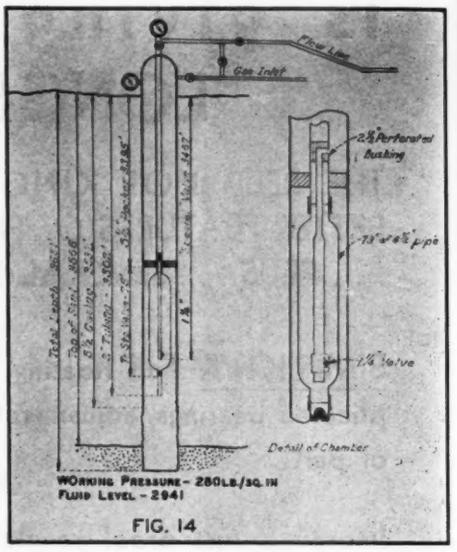


FIG. 14

of the casting. The valve depends for its action upon the weight suspended on a cable to strike the ball from the inside of the casing, forcing the ball away from its seat. When a series of valves are placed in a string of tubing in a well, the weight opens the valves successively downward, until a working fluid level is reached. The balls remain away from the seats, only while the weight is in the casting containing the ball.

Recent developments on this device have been toward lifting and lowering the weight, by a gas-driven hoist. This device has been used in only a few wells in the East Texas field.

General Discussion of Present and Future Valve Settings

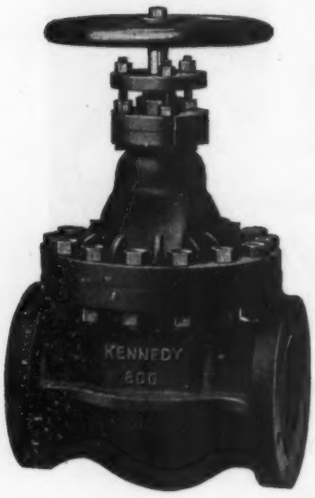
The proper settings of valves in wells, regardless of the valve types, is more important than one would think when first entering the field of gas-lift. It has long been a hope among gas-lift engineers, and manufacturers that some day valves could be taken to a well with a definite setting to follow, and such a setting would continue to work to the depletion of the well. We are not convinced that this will not some day become a reality, but at the writing of this paper it is still a hope.

Considerable progress has been made in the development of proper spacings for known well conditions, but certain conditions must be determined, if satisfactory results are to be obtained.

Before attempting to equip a well with valves, it is first necessary to determine the approximate

(Continued on Page 86)

Valves *for pipe lines*



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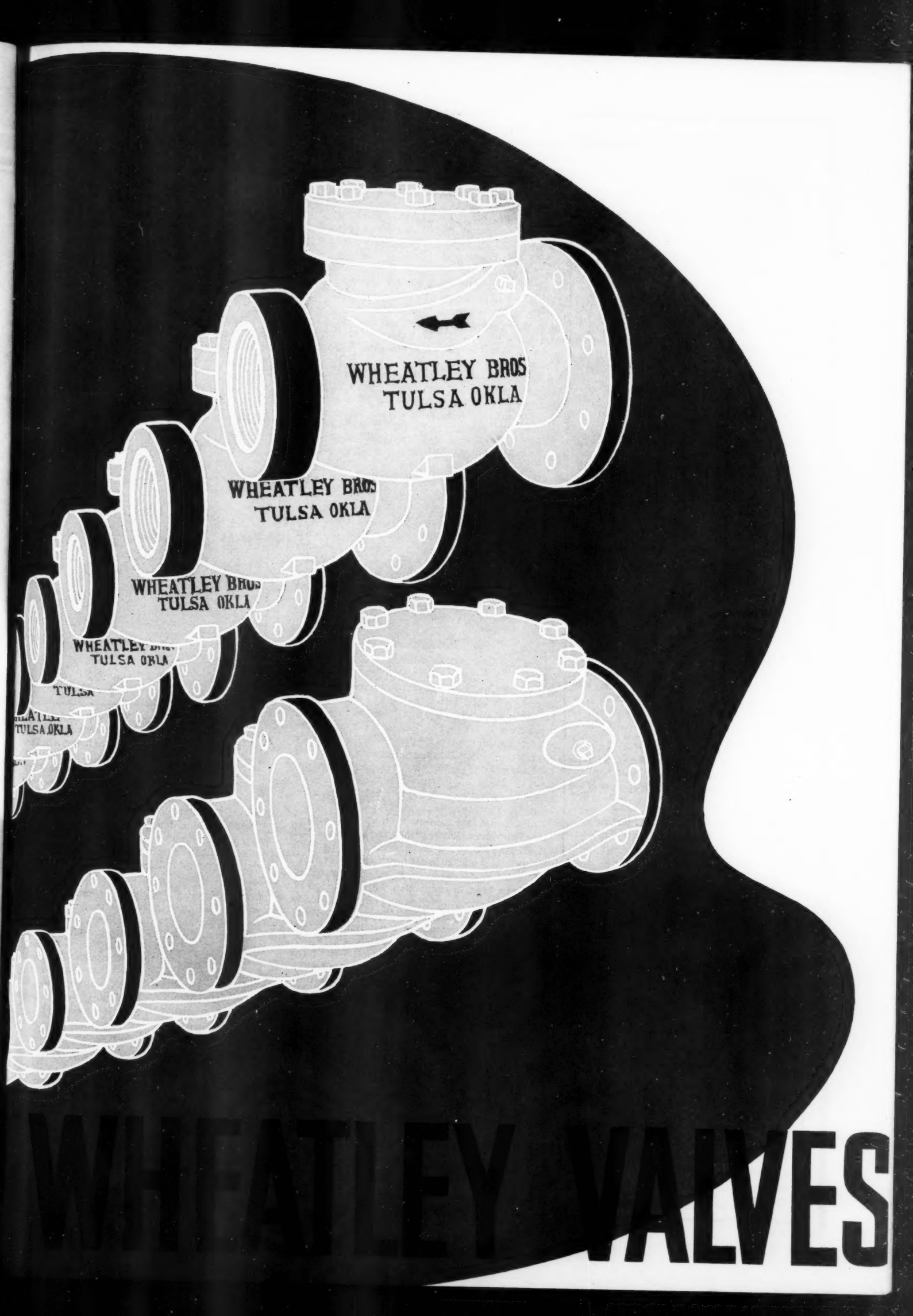
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TULSA
TULSA OKLA
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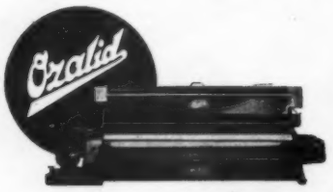

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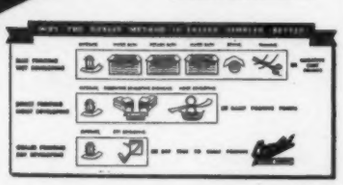

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OG-8

(Continued from Page 82)

static fluid level. This can be done by using a subsurface-pressure gauge or a float. The use of a gauge is preferred because gas often hinders proper working of a float and the result is a false fluid level. When a gauge is used, the reading obtained is multiplied by three, since East Texas crude weighs about one-third pound per foot, and the height of the fluid standing in the hole is determined. After this has been done, valve spacing can be calculated. Best results have been obtained by spacing the top valve approximately 200 feet above the determined static fluid level. This is done to be certain that the upper valve is always above the fluid level, to take care of fluctuating levels. Calculations are then made to determine the drop in level in the annular space between the tubing and casing, and the rise in level inside of the tubing when a given or working pressure is applied to the casing. These figures and the calculations of the amount of fluid drop in the casing, caused by the removal of the well's daily allowable, gives the working fluid levels in the annular space. Care is taken to space from three to five valves at intervals of approximately 180 feet in the space determined to be the working fluid level. Any lower valves might be spaced at 300 feet apart, Figure 11.

In wells, only capable of producing 20 bbls. or less, it has been found that good results might be obtained with spacings of approximately 250 feet between valves, from the perforation above the packer, upward to approximately 200 feet above the static fluid level. Such wells will always have the gas to flow around through the perforations at the end of the flow period. This pertains to wells where the casing and tubing gas is released at the end of the flow periods. See Figure 12 for detailed drawing. Gas measurements are taken at least once per month on each well.

Intermitters

Surface intermitters, where gas is admitted at intervals, for gas-lift work, have been used for many years, but not until recently have subsurface intermitters been introduced. First work in this connection was the usage of a closed setting, using a packer with no perforations above it, and three regular outside type valves, spaced approximately 300 feet apart. All oil in the annular space between the casing and the tubing was displaced before setting the packer. It was found that interval heading action was obtained, but the intervals between the heads were erratic.

An attempt was then made on a similar setting using two valves. Better results were obtained, but valve leakage between heads soon caused paraffin accumulations, and such settings were removed.

The latest development in intermitter operations have been in connection with the usage of specially designed chambers, and only one outside type valve, set to open with a 100-pound fluid head, with a 300-pound maximum input line pressure, (see Figures 13, 14 and 15), and close at a 200-pounds differential pressure. Several wells have been equipped with such settings, and the results have been so gratifying that the writer is now planning such settings for other than "stripper wells." It is believed that each well's output, over 24-hour periods, can be regulated by the depth at which the intermitter chamber is submerged, together with the input pressure.

In summarizing this paper, the gas-lift wells of the East Texas field may be divided into four distinct classes.

1. High fluid level wells, capable of producing more than the prorated allowables.

2. Low fluid level wells capable of producing the marginal allowables of 20 bbls. or slightly more, per day.

3. High fluid level wells with high percentages of water.

4. Wells capable of producing less than the marginal allowables of 20 bbls. per day.

The first of these groups are very simple wells to handle with gas-lift. These wells need only to be agitated to start flow, and consequently little thought is necessary for valve spacings, to obtain low ratios on input gas or high velocity. Wells of this group have bottom-hole pressures ranging from about 700 to 900 pounds per square inch.

The second group comprises wells which are more difficult to handle, because gas usually flows around the bottom perforations, at the end of the producing periods. In many of these wells it is necessary to release the casing pressures at the end of producing periods, to allow oil to fill into the tubing and annular space between the tubing and casing when conventional settings as shown in Figure 11 are used. With this type of operation it is difficult to operate at ratios under 2,000 cubic feet per barrel. We believe the answer to our problem with these wells has been found in the chamber intermitters as shown in Figure 13.

The wells of the third group are similar to the first group, in that the fluid levels are high and

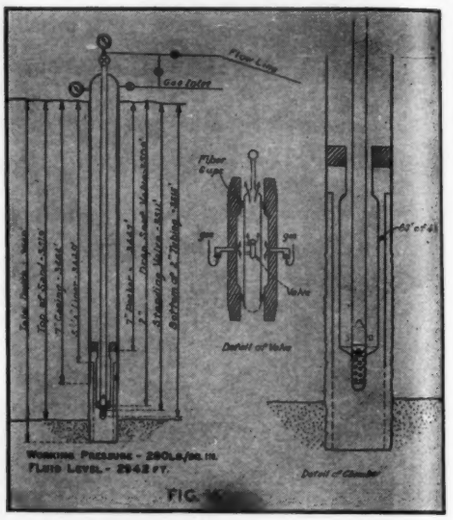

FIG.

such levels are maintained even though rapid rates of flow are obtained. Such wells are being handled with many different types of valves and settings.

The last mentioned group are the most difficult to handle, because fluid levels are low and rates of "fill in" vary considerably. Such wells have been handled to depletion with different valve types and settings, but in all cases thus far, excessive gas volumes have been used. Our present chamber intermitter settings, Figure 14, seem to be the answer to efficient operations for these wells.

In this paper, the writer has endeavored to show the working principles of various types of valves and their application, besides trying to show the considerable possibility that gas-lift may successfully produce the wells of the East Texas field to depletion. It is believed that the developments and future possibilities in gas-lift are such as to warrant consideration from all operators to the extent that the further development of the methods and equipment should be greatly accelerated.

Acknowledgements

In the preparation of this paper the writer has used his own descriptions of valves and settings. These may not in all cases agree with the manufacturer. All pictures of valves have been taken from manufacturers' prints. Many valves, not mentioned in the report, have been used in the East Texas field, but the writer has tried to limit this discussion to valves with which he is familiar.

The author is indebted to Ralph A. Watson for preparing the figures used in the paper and to the Humble Oil & Refining Co. for permission to publish the paper.

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Solvent Refining of Lubricating Oils: the Operator's Viewpoint

By V. A. KALICHEVSKY, T. P. SIMPSON and B. W. STORY
Socony-Vacuum Oil Co., Inc.

The possibility of employing solvent methods for refining petroleum oils was first shown by Butlerov[1] as early as 1870, but it was not before the beginning of this century that such methods were applied commercially—first for refining kerosine and later to the manufacturing of lubricating oils. Delay in the practical application of solvent-refining methods might be explained partly by the lack of cheap solvents and by the inadequacy of mechanical and constructional facilities in the past. Some delay was caused by lack of appreciation of the characteristics of solvent-refined oils, and also because the attention of the petroleum industry was absorbed for some years with the rapid development in distillation equipment and technique. In fact, it is probable that the economic success of solvent-refining processes is largely due to the great strides made in distillation practices immediately preceding the introduction of these processes.

The effects of aromatics on the burning quality of kerosines had been recognized for many years. The search for a method of removing them better than by acid refining led to discovery of the solvent power of liquid sulfur dioxide and the development of the Edeleanu process. Similarly, when it was recognized that many of the undesirable characteristics of lubricants were due to compounds of an aromatic nature, solvents were found which were capable of removing them from those oils.

A large percentage of the lubricating oils made from petroleum is intended for use in internal-combustion motors, and certain properties have become recognized as desirable in such oils. The more important of these properties appear to be a flat viscosity-temperature gradient commonly measured in terms of viscosity index, good resistance to oxidation, and a low carbonizing tendency. Various tests are used to evaluate oxidation resistance and carbonizing tendency. Oxidation resistance is hard to define, and no single test seems adequate to evaluate it. The carbon-residue test will be assumed as an index of the carbonizing tendency of an oil, even though it is occasionally misleading.

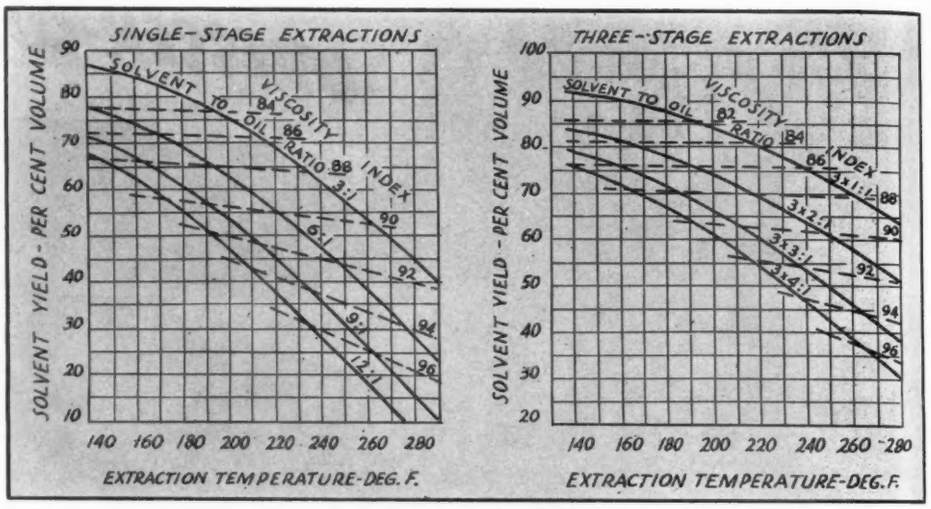


Fig. 1—Solvent "A"

Lubricating oils are a very complex mixture of large hydrocarbon molecules. The molecules may be considered as mostly hybrids consisting of aromatic or unsaturated rings, naphthenic or saturated rings, and saturated chains in varying proportions. It is obvious that, in building large molecules with various proportions of these three types of carbon linkage, a wide variety of compounds can result. Hence, in speaking of an oil, or any part of it, as aromatic or naphthenic or paraffinic, we really mean that one or the other of the above types of carbon linkage predominates in that particular oil or part of it. Pure compounds of either type are not usually present in lubricating oils. Waxes come closer to being pure compounds (paraffinic chains), but dewaxing and dewaxing solvents are not considered in this article.

It has been found that compounds of predominantly aromatic type are characterized by low viscosity index and poor oxidation resistance and, therefore, are undesirable from the standpoint of the refiner. Aromatic types also tend to increase the carbon residue, but in this respect they are not as significant as the asphaltic compounds. Asphalts are compounds of very high molecular weight, and exist in the oil in a highly-dispersed colloidal state. There are other compounds of an unstable nature which are easily polymerized to asphalts by heat or oxidation. Both might be considered analogous to the "preformed" and "potential" gum in gasolines. In addition, there are resinous compounds which may be light-colored and relatively stable to oxidation. All of these asphalts and resins have in common the property of being non-distillable in the ordinary sense. In other words, at all ordinary pressures they vaporize at temperatures far above the point at which they break down to form carbon. The usual refining solvents do not remove asphalts very effectively; and, if asphalts are present in large amounts, they are best removed by distillation or by the precipitation type of solvents such as propane, amyl al-

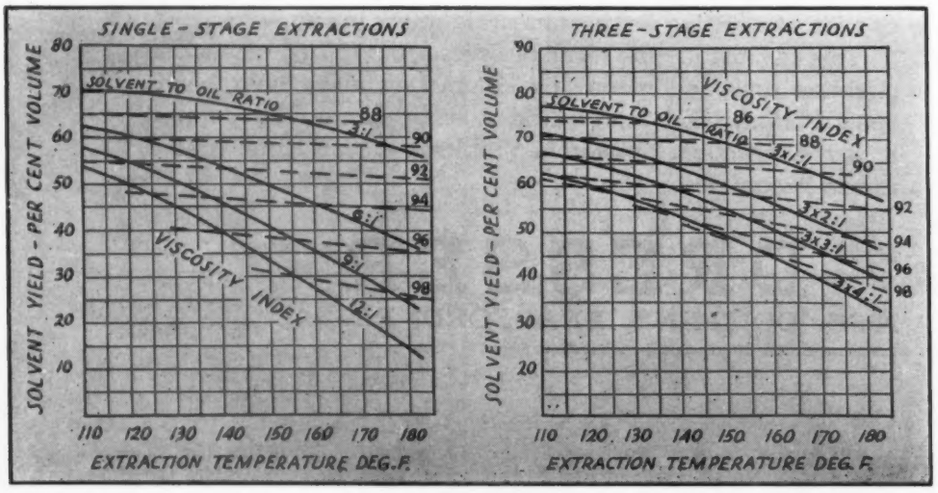
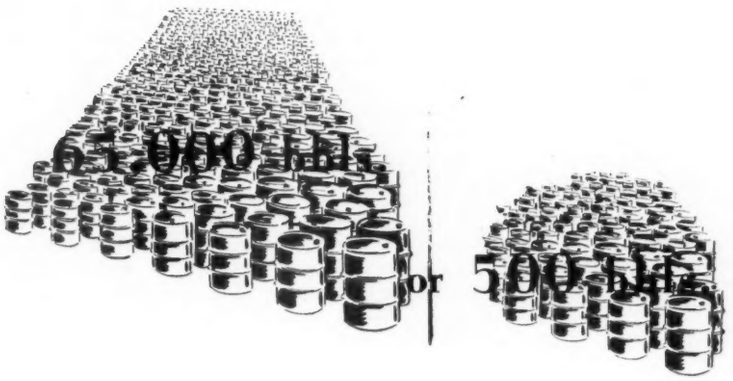


Fig. 2—Solvent "B"

A.P.I.—Presented before the mid-year meeting, June 1 to 3, Colorado Springs, Colorado



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cohol, and others. A detailed discussion of de-asphalting processes, however, is somewhat beyond the scope of this article.

Commercial solvents for refining lubricating oils are mostly organic compounds or mixtures of compounds having a limited solubility in paraffinic or naphthenic hydrocarbons at ordinary temperatures but relatively good solvent power for aromatic-type hydrocarbons at the same temperatures. In other words, refining solvents have a preferential solubility for compounds of the aromatic type, and will selectively extract the predominantly aromatic types from a mixture of hydrocarbons such as a lubricating-oil fraction. However, other factors being equal, refining solvents have a somewhat greater solvent power for compounds of lower molecular weight, and it is possible for a solvent to extract compounds of low molecular weight of a relatively paraffinic nature.

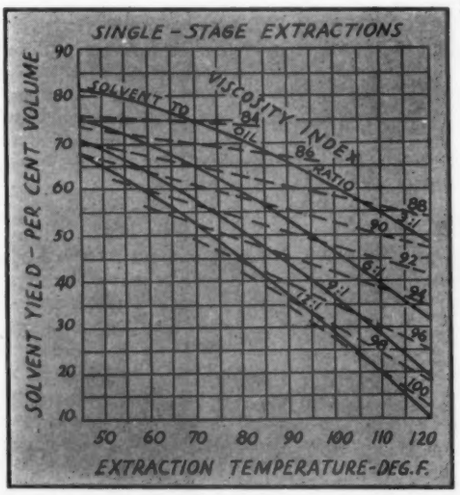

Fig. 3—Single-stage extractions, Solvent "C"

and fail to remove others which are relatively more aromatic but of higher molecular weight. For this reason, it may be inadvisable to solvent-refine a very wide fraction or a blend of widely different stocks. The stock may be over-refined on the lighter end and under-refined on the heavier end. This may not be evident from the viscosity index, but the oxidation resistance under certain conditions may be affected.

Refining solvents vary somewhat in solvent power, which is the ability to hold the aromatic constituents of the oil in solution. Solvent power is important because it influences the amount of solvent required to remove a given amount of impurity from a given stock. The solvent power of any solvent is increased by raising the temperature, but there are objections to carrying this expedient too far because of the effect on selectivity. The selectivity of a solvent is its ability to distinguish between the aromatic type of compounds and those of the naphthenic and paraffinic types. If a solvent cannot do this, it obviously has no value as a refining agent.

Considering the wide differences in chemical constitution of the various refining solvents now used, one would expect fairly-wide differences in their selectivity. Practically, this is not the case; because, while there may be marked differences between the solvents in their pure state, in practice we are not dealing with pure solvents but with a solvent-oil system. The oil must be considered as reacting on the solvent as well as the reaction of the solvent on the oil. Analysis of a solvent-refining system shows that the raffinate is in equilibrium with nearly pure solvent, and the amount of solvent dissolved in the raffinate is quite small —perhaps 10 per cent. Therefore, it is not surprising that the quality of the raffinate is much more a function of the stock being treated than a function of the solvent used. On the other end of the system we have the extract, which is mostly solvent, in equilibrium with the charging stock.

The solvent is carrying in solution an appreciable amount of aromatic compounds removed from the oil. When aromatic compounds are added to any refining solvent, they tend to increase the solubility of oil in the solvent until, when enough is added, the solvent and oil become completely miscible and the solvent can then no longer function as a refining agent. The amount and kind of aromatics present in the solvent are, of course, a function of the charging stock; and, as the influence of the aromatics on the solvent is very great, the type of oil charged to the system is really the dominant factor. As a result, it is found that practically all of the commercially-used solvents give about the same quality and yield of raffinate from a given charging stock if the best treating conditions are used for each of the solvents. Fig. 1, 2 and 3 are constructed from data obtained with three of the most widely used commercial solvents in one-stage and three-stage systems. A temperature and solvent ratio may be found for each which gives practically the same quality and yield of oil. A detailed technical discussion of these graphs

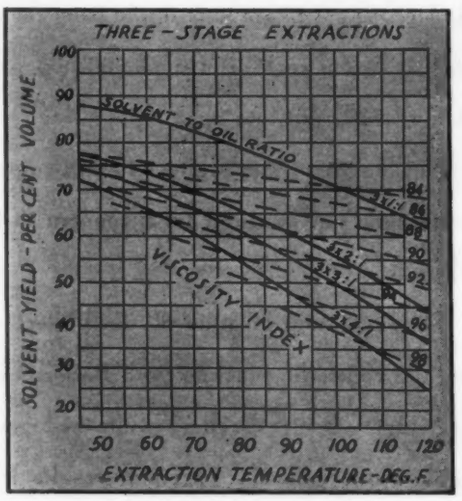

Fig. 3-A—Single-stage extractions, Solvent "C"

will be published shortly in *Modern Methods of Refining Lubricating Oils*, by V. A. Kalichevsky.

However, all solvents will not operate upon all charging stocks with equal economy, as some solvents are better suited to handle certain stocks than others. This does not apply to the treatment of residuum stocks where a large amount of asphaltic material is present. The Duo-Sol process, for instance, cannot logically be compared with single solvents on such stocks because, owing to the action of propane, the Duo-Sol process is essentially a combination de-asphalting and solvent-refining process and is, therefore, particularly suited to asphalt-bearing stocks. In the absence of asphalt, this advantage disappears.

From the foregoing it is obvious that the charging stock is the most important factor in solvent refining; and, while it may not determine which of the various commercial processes should be used, it will strongly influence the choice of treating conditions for efficient operation as well as the yield and quality of the finished product. Solvents vary in boiling point; and, as the solvent is generally recovered from the raffinate and extract phases by distillation, it is necessary to have a certain differential between the boiling point of the solvent and that of the oil. Therefore, the lower-boiling solvents can be used to treat lighter oils than would be practical with higher-boiling solvents. All solvents do not have the same selectivity or solvent power at the same temperature, and this again varies with the stock to be treated. Light oils of a predominantly aromatic or naphthenic nature require lower treating temperatures than heavy oils of a paraffinic nature. Light Coastal oils, for instance, require very low treating temperatures with some solvents, and, therefore, refrigeration would be necessary; while other solvents might be used at ordinary temperatures on the same stocks, and save the cost of refrigeration. Conversely, on viscous paraffinic oils, some solvents may be used at ordinary temperatures, while others require considerably elevated temperatures.

Elevated temperatures sometimes have a practical advantage, particularly with viscous oils having a high wax content. Higher temperature reduces the viscosity of the oil, and allows more intimate contact with the solvent. It also tends to reduce the danger of wax emulsions in the treater by holding the wax in solution. Hence, what might appear to be an expense for additional heat may in reality be a good investment from the standpoint of ease of operation or additional treating capacity.

While solvents permit the refiner far more latitude in the degree of refinement to which a stock may be treated than was generally possible with acid, there are limits beyond which it is not economical or even desirable to go. A higher viscosity index may usually be obtained with solvents than with acid from a given stock, but a point is reached where the viscosity index increases very slowly while the yield decreases rapidly, and that is obviously the economic refining limit for the particular stock in question. It is not always advisable to refine stock to the economic viscosity-index limit, because a distinct loss in oxidation resistance may develop before that point is reached. Therefore, the maximum viscosity index which a stock is capable of producing economically may not be

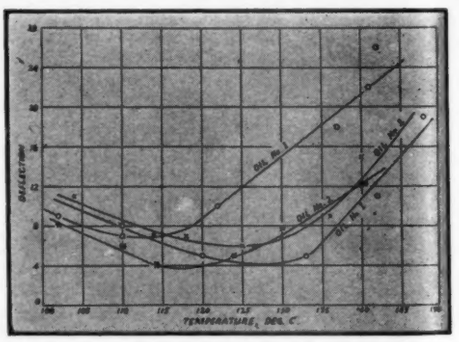

Fig. 4—Tests on Kingsbury machine

the best point to carry the refining in practice.

Solvent-refining operations appear quite simple, but operating a solvent-refining plant is not simple because of the several factors involved and the effect that each may have on the others. The solvent must be brought into intimate contact with the charging stock, and sufficient time allowed for the solvent to take up all of the undesirable part of the oil that it will under the conditions chosen. The time required will, of course, depend upon the amount of interface present or the dispersion of the oil in the solvent. When the solvent and oil have come to as nearly complete equilibrium as possible, they must then be separated as completely as possible. The time required for separation will depend upon the difference in gravity between the oil and solvent phase, the viscosity of the system, the degree of dispersion, and whether or not an emulsifier is present.

It is evident that a fine dispersion of oil in the

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solvent accelerates extraction but delays separation. Time, of course, determines the amount of material which must be held in the system for a given throughput and, therefore, affects the cost of solvent, equipment, etc. In practice it is, therefore, necessary to compromise on the degree of dispersion which will give the best extraction and separation in a reasonable time. It is possible to use mechanical aids to accelerate both extraction and separation. High-speed mixers have been used in conjunction with centrifuges, but both consume power and require additional cost for upkeep. There is still another way of decreasing time and compensating for the losses due to imperfect mixing, viz., more stages.

A single sieve will separate completely pebbles having a diameter of one-half inch from those having a diameter of one-quarter inch, but solvents do not work that way. Solvents will only remove a certain proportion of the impurity present, and, therefore, a succession of mixtures of solvent and oil must be made in order that extraction of the undesirable materials in the oil may approach completion. If the amount removed by any particular stage is not quite what it should have been, the failure may be corrected by adding one or more stages. When equilibrium is completely reached in each stage and separation of the phases is also complete, there is little to be gained in using more than seven or eight stages for severe refining, and even less if refinement is not to be carried very far. In practice, however, it may be advisable to employ less perfection in mixing and separation and introduce more stages. This is encountered in practical operation of the packed-tower treater.

It so happens that most of the compounds having properties suitable for refining agents also have specific gravities substantially higher than oil. Therefore, if a drop of oil is introduced at the bottom of a column of solvent, it will rise to the top and be continually in contact with fresh solvent throughout the trip from bottom to top. If horizontal equilibrium between the solvent and the oil were fast enough, the drop of oil would have to travel only a few diameters to be completely refined, and a treating tower only 1 in. or 2 in. in height would suffice. By extending the tower to many feet, it is possible to compensate for the lack of equilibrium at any one point and accomplish the same result. As towers have no moving parts and the liquid "hold up" is usually small compared with stage treaters, they are coming into wider use. At any one point they may be considered as inefficient; but that is overcome by the large number of effective stages which they contain because of their great height—and the over-all result is generally better than an eight-stage treater if they are carefully operated.

Another method of compensating for imperfect equilibrium between solvent and oil is the use of a temperature gradient. Mention has been made of the fact that increasing the temperature increases the solvent power of a solvent but decreases its selectivity. Mention has also been made of the fact that the presence of aromatic constituents in the solvent reduces the selectivity. In all counterflow systems the solvent gradually picks up aromatics as it travels from the raffinate end, where it is introduced, to the extract end where it departs; and, hence, the solvent is continually losing selectivity. The yield is determined entirely by the state of affairs on the extract end of the system. In other words, the yield is what the solvent does not elect to carry away with it as extract. Yield is, therefore, a function of the charging stock, the solvent, the solvent-to-oil ratio, and the temperature at the extract end of the system. On the other hand, the quality of the raffinate will be a function of the stock, the solvent, the solvent-to-oil ratio, and the temperature at the raffinate end. Practically speaking, the identity of the solvent drops out, and may be disregarded. The important consideration is the progressive change in solvent power and selectivity of the solvent throughout the system. A solvent ratio capable of producing a raffinate of desired quality may display too much solvent power at the extract end of the system, and result in a low yield. If, however, the temperature is increased at the raffinate end, less solvent may be used. By gradually decreasing the temperature towards the extract end, compensation for the increasing solvent power of the solvent is obtained and the quality-yield ratio may be improved, but care must be used in adjusting the temperature gradient to the optimum inherent to the system. Otherwise, the quality or yield of the raffinate may drop.

Compensation for excessive solvent power and loss of selectivity of the solvent may be accomplished in other ways. In the case of mixed solvents such as benzol-sulfur-dioxide, it might be done by changing the solvent ratio as, for instance, increasing the sulfur dioxide toward the extract end. With single solvents it may be done by adding water or another solvent toward the extract end, but the principle remains the same.

While on the subjects of temperature gradients, selectivity, and solvent power—mention might be made of a difficulty which is sometimes encountered in practice. One or more of the stages may form a complete solution; i.e., the two phases disappear. This may be due to too high temperature, too high concentration of aromatics in the solvent at that point, or both. It can be corrected by dropping the temperature, using more solvent or modifying the solvent with water, etc. A higher solvent ratio is usually advisable.

Occasionally, a failure to get good separation is due to the formation of emulsions. Any system dealing with two immiscible liquids is subject to emulsification, particularly if a finely-divided insoluble material is present. In the case of solvent refining, such a material might be wax or asphalt. If improper separation of the solvent and oil phases is encountered, it should first be determined whether a solution or an emulsion is the cause. It can then be corrected accordingly.

From what has been said, it is clearly impossible

TABLE 1

Charging Capacity of Solvent-Refining Plants Producing Lubricating Oils

Process	January 1930			January 1933			January 1934			January 1935			January 1936			January 1937			January 1938 (Estimated)		
	Barrels Per Day	Total (Per Cent)	Present Capacity (Per Cent)	Barrels Per Day	Total (Per Cent)	Present Capacity (Per Cent)	Barrels Per Day	Total (Per Cent)	Present Capacity (Per Cent)	Barrels Per Day	Total (Per Cent)	Present Capacity (Per Cent)	Barrels Per Day	Total (Per Cent)	Present Capacity (Per Cent)	Barrels Per Day	Total (Per Cent)	Present Capacity (Per Cent)	Barrels Per Day	Total (Per Cent)	Present Capacity (Per Cent)
PLANTS IN THE UNITED STATES																					
Duo-Sol	....	....	....	....	....	....	...	....	....	10,342	55.18	68.71	13,022	28.57	100.00	13,022	26.81	100.00	13,022	26.81	100.00
Furfural	....	....	....	....	....	...	1,600	47.06	11.35	1,600	8.54	11.35	11,100	24.36	78.72	14,100	29.02	100.00	14,100	29.02	100.00
Phenol	....	....	....	....	....	....	....	....	....	....	....	....	10,500	23.04	100.00	10,500	21.62	100.00	10,500	21.62	100.00
Chlorex	....	....	....	800	100.00	13.01	1,800	52.94	29.27	4,500	24.01	73.17	6,150	13.50	100.00	6,150	12.66	100.00	6,150	12.66	100.00
Sulfur-dioxide-benzol	....	....	....	....	....	....	...	...	....	1,500	8.00	100.00	1,500	3.29	100.00	1,500	3.09	100.00	1,500	3.09	100.00
Nitrobenzene	....	....	....	....	....	....	....	....	....	....	....	....	2,500	5.49	100.00	2,500	5.15	100.00	2,500	5.15	100.00
Nitrobenzene-sulfuric acid	....	....	....	....	....	....	....	....	....	800	4.27	100.00	800	1.75	100.00	800	1.65	100.00	800	1.65	100.00
Total	....	....	....	800	100.00	1.58	3,400	100.00	6.72	18,742	100.00	37.04	45,572	100.00	94.07	48,572	100.00	100.00	48,572	100.00	100.00
PLANTS IN EUROPE AND CANADA																					
Duo-Sol	....	....	....	....	....	....	....	....	....	..	....	....	2,030	25.44	21.44	4,590	34.64	48.47	9,470	45.56	100.00
Furfural	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1,710	12.91	39.17	4,366	21.01	100.00
Phenol	2,000	100.00	34.48	2,000	100.00	34.48	5,500	100.00	94.83	5,500	100.00	94.83	5,500	68.92	94.83	5,800	43.77	100.00	5,800	27.90	100.00
Sulfur-dioxide-benzol	....	....	....	....	....	....	....	....	....	....	....	....	450	5.64	39.13	1,150	8.68	100.00	1,150	5.53	100.00
Total	2,000	100.00	9.62	2,000	100.00	9.62	5,500	100.00	26.46	5,500	100.00	26.46	7,980	100.00	38.39	13,250	100.00	63.74	20,786	100.00	100.00
PLANTS IN THE WORLD																					
Duo-Sol	....	....	....	....	....	....	....	....	....	10,342	42.66	45.98	15,052	28.11	66.92	17,612	28.49	78.30	22,492	32.43	100.00
Furfural	....	....	....	....	....	....	1,600	17.98	8.66	1,600	6.60	8.66	11,100	20.73	60.11	15,810	25.57	85.62	18,466	26.63	100.00
Phenol	2,000	100.00	12.27	2,000	71.43	12.27	5,500	61.80	33.74	5,500	22.69	33.74	16,000	29.88	98.16	16,300	26.37	100.00	16,300	23.50	100.00
Chlorex	....	....	....	800	28.57	13.01	1,800	20.22	29.27	4,500	18.56	73.17	6,150	11.48	100.00	6,150	9.95	100.00	6,150	8.87	100.00
Sulfur-dioxide-benzol	....	....	....	....	....	....	....	....	....	1,500	6.19	56.60	1,950	3.64	73.58	2,650	4.29	100.00	2,650	3.82	100.00
Nitrobenzene	....	....	....	....	....	....	....	....	....	....	....	....	2,500	4.67	100.00	2,500	4.04	100.00	2,500	3.60	100.00
Nitrobenzene-sulfuric acid	....	....	....	....	....	....	....	....	....	800	3.30	100.00	800	1.49	100.00	800	1.29	100.00	800	1.15	100.00
Total	2,000	100.00	2.88	2,800	100.00	4.04	8,900	100.00	12.83	24,242	100.00	34.95	53,552	100.00	77.21	61,822	100.00	89.13	69,358	100.00	100.00
COMPARISON OF PLANT CAPACITIES IN THE UNITED STATES AND ABROAD																					
United States	....	....	....	800	28.57	1.58	3,400	38.20	6.72	18,742	77.31	37.04	45,572	85.10	94.07	48,572	78.57	100.00	48,572	70.03	100.00
Europe and Canada	2,000	100.00	9.62	2,000	71.43	9.62	5,500	61.80	26.46	5,500	22.69	26.46	7,980	14.90	38.39	13,250	21.43	63.74	20,786	29.97	100.00
Total	2,000	100.00	2.88	2,800	100.00	4.04	8,900	100.00	12.83	24,242	100.00	34.95	53,552	100.00	77.21	61,822	100.00	89.13	69,358	100.00	100.00

Again

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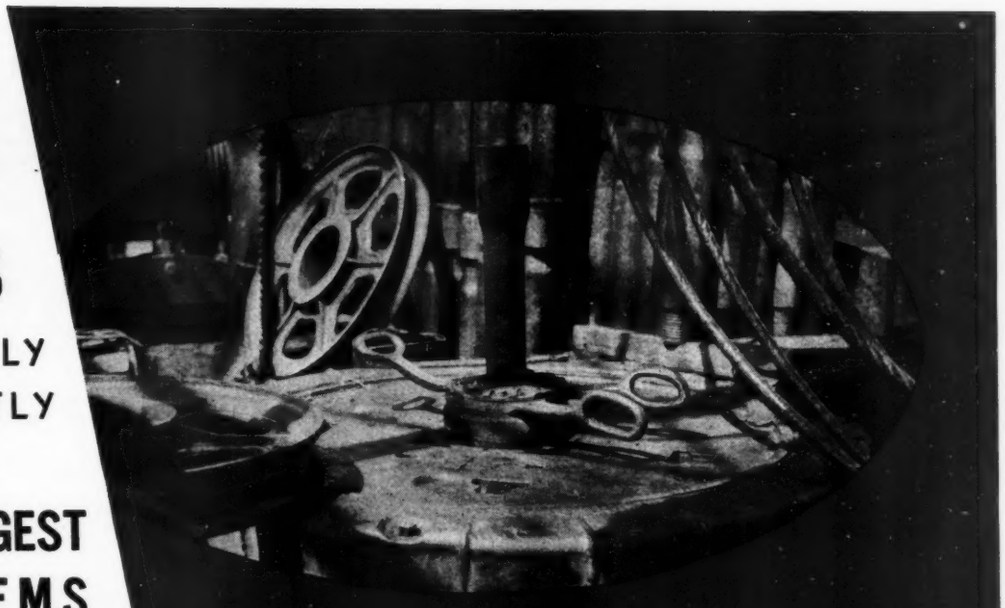
HANDLE SAFELY and EFFICIENTLY one of the

WORLD'S LONGEST DRILL STEMS



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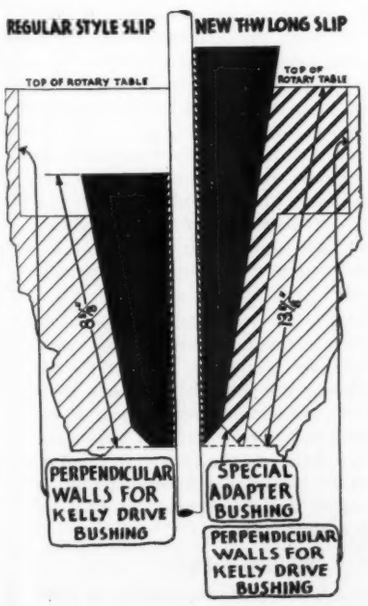
FOR DEEP WELLS

T-I-W Long Reliner Type Slip, with adapter which makes 62 percent added length possible, giving 20" bearing surface against pipe.



COMPARE

Note in the illustration at the left the T-I-W LONG SLIP FOR DEEP WELLS on one side of the pipe, and the regular type slip on the other side of the pipe. The special split bushing, constructed to utilize for slip bearing that part of the rotary normally occupied by the Kelly drive bushing, EXTENDS THE EFFECTIVE GRIPPING AREA OF THE T-I-W LONG SLIP 62%.

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to make a fair direct comparison of the various commercial processes now in use because of the widely-different nature of the charging stocks they are handling. No one process is best for every stock; and, therefore, no single stock can be used for such a comparison except by the refiner who is interested in that particular stock to the exclusion of all others. Neither is it fair to discuss the mechanical equipment in vogue at the moment with any particular process. Solvent processes are comparatively young, and practically all have been changed more or less since their introduction. It seems unquestionable that other changes will be made, and that some may even be under way. We might dwell on details of the chlorex or furfural processes, for instance, only to find that tomorrow they are no longer simply chlorex and furfural but have had something added to them, as happened with the Edeleanu process.

It, therefore, appears possible only to list the actual accomplishments of the more important processes from the most recent data we have been able to collect, and pass on to a brief consideration of solvent-refined oils and some of their properties compared with oils in use before the advent of solvent refining.

With this thought in mind, we have summarized in Table 1 the charging capacities of lubricating-oil solvent-refining plants throughout the world during the last few years. Plants using straight sulfur dioxide have a total capacity of 92,260 bbl. per day; but they are not included in the summary, because they are used mostly for refining light petroleum products such as kerosine.

Considering viscosity index, carbon residue, and oxidation stability of petroleum oils as the measures of oil improvement in solvent-refining operations, the advantages of solvents over the older acid-refining methods may be easily observed. In acid-refining Mid-Continent stocks for manufacturing oils of approximately SAE-40 grade, it was barely possible to obtain products which had a carbon residue below approximately 0.8, except with overhead stocks, while the viscosity index could not be improved more than to 85-90. The oxidation stability of such oil was likewise below that of the present oils. Solvent-refining methods applied to residual stocks permit manufacture of similar types of oils having a carbon residue of about 0.2 and a viscosity index of 100, while their oxidation stability is greatly improved. Table 3 gives a comparison of acid-refined and solvent-refined oils marketed during 1932 and 1937, respectively.

While the above discussion shows the effect of solvent refining on Mid-Continent stocks, similar advances were made in manufacturing oils from Pennsylvania crudes. These oils contain only small quantities of "preformed" asphalt, and their carbon residue can be effectively reduced by applying solvents followed by clay percolation. The effect of such preliminary solvent refining on the properties of finished products may be likewise visualized from the comparisons in Table 4.

The above typical data show the progress made in manufacturing lubricating oils and the extent of the improvement of commercial products which are now being marketed.

No convincing data have been published so far to show that solvent-refined oils differ from acid-refined oils with respect to oiliness or wear when strictly comparable test conditions were employed. The following data are typical when oils of equal viscosity, and from the same crude source, are used. Oil No. 1 was acid-refined, while oil No. 2 was solvent-refined. Both were of Mid-Continent origin, and were handled exactly alike except for the difference in the refining agent used. Wear tests were made with a Timken machine, and friction load curves with a Kingsbury machine.

TABLE 2

Solvent Data

	Propane	Sulfur Dioxide	Benzol	Cresylic Acid	Phenol	Chlorex	Furfural	Nitrobenzene
Molecular weight	44.08	64.12	78.05	108.06	94.05	142.98	96.03	123.05
Melting point, deg. F.	−310	−99	41.9	.....	105.6	−12	−34	42.5
Boiling point, deg. F. (760 mm. mercury)	43.8	14	175.3	365-400	361	352.4	323	411.5
Vapor pressure at: 100 deg. F. (mm. mercury)	9,460	4,370	176	.....	....	2	7	0.9
Vapor pressure at: 286 deg. F.	.....	45,524	3,520	160 approximate	264	.....	.....	100
Critical temperature, deg. F.	212.2	311	552	800 approximate	786	.....	746	.....
Critical pressure, lb. per sq. in., absolute	643.3	1,160	700	740 approximate	889	.....	798	.....
Latent heat of vaporization, B.t.u. per lb.	183.0	167	169.7	180	206	115.4	193.5	142
Specific heat, B.t.u. per lb. per deg. F.	0.658	0.32	0.41	0.53	0.56	0.369	0.416	0.34
Specific gravity, 68/68 deg. F.	0.5116	1.45	0.8050	1.045	1.072	1.222	1.1622	1.207
Flash point, deg. F.	.....	....	10	180	174	168	138	208
Solubility in water: at 77 deg. F.	.....	....	0.07 per cent	2.5 per cent	9 per cent	1.01 at 20 deg. C.	8.5 per cent	0.2 per cent
Solubility in water: at 100 deg. F.	.....	599 cc.	.....	3.1 per cent	....	1.71 at 90 deg. C.	9 per cent	0.25 per cent

TABLE 3

Comparison of Mid Continent Motor Oils

	1932 (Acid-refined)		1937 (Solvent-refined)	
	SAE-40	SAE-60	SAE-40	SAE-60
Gravity, deg. API	25.7	23.7	28.8	28.0
Pour point, deg. F.	20	25	0	5
Flash point, deg. F.	430	480	460	515
Fire point, deg. F.	490	535	520	585
Viscosity (Saybolt Universal) at 100 deg. F., sec.	770	1,765	660	1,437
Viscosity (Saybolt Universal) at 210 deg. F., sec.	73	110	73	110
Viscosity index	83	80	100	98
Carbon residue, per cent	0.9	1.4	0.2	0.3
Color (Lovibond)	170	240	60	80
Sligh oxidation No.	17	4	0	0

TABLE 4

Comparison of Pennsylvania Motor Oils

	1932 (Percolated and Dewaxed)		1937 (Solvent-refined, Percolated, and Dewaxed)	
	SAE-20	SAE-60	SAE-20	SAE-60
Gravity, deg. API	28.4	26.2	31.1	28.5
Pour point, deg. F.	5	20	0	0
Flash point, deg. F.	430	510	430	540
Fire point, deg. F.	485	575	480	610
Viscosity (Saybolt Universal) at 100 deg. F., sec.	373	1,736	294	1,543
Viscosity (Saybolt Universal) at 210 deg. F., sec.	57	123	55	122
Viscosity index	100	98	117	105
Carbon residue, per cent	0.6	1.5	0.3	0.4
Color (Lovibond)	120	300	70	30
Sligh oxidation No.	4.0	1.0	0	0

TIMKEN WEAR TESTS

	Width of Scar in Millimeters	
	Oil No. 1	Oil No. 2
Run No. 1	1.28	1.33
Run No. 2	1.02	1.03
Run No. 3	1.11	1.09
Average	1.14	1.15

Friction-load curves in Fig. 4 also show the practical equivalence of these two oils.

Today, solvent-refined oils are recognized as products of premium quality, and are preferred by buyers to conventionally-refined oils of equal cost. In the early stages of their development, this was not always the case. For example, the introduction of the newer higher-strength bearing alloys brought with them cases of bearing corrosion which were at that time attributed to solvent-refined oils. These failures were afterwards traced to their source, being most frequently the result of engine operation at excessive crankcase temperatures which were set up at sustained road speeds above 70 m.p.h.

As a matter of fact, careful research showed that typical solvent-refined oils were less prone to corrode bearings than the widely-accepted Pennsylvania oils which were conventionally refined. They were, however, more prone to cause corrosion than the coastal oils, which tended to form sludge rather than acids during oxidation. Much credit must be given the petroleum industry for studying this problem with an open mind.

A similar situation existed in the lubrication of engines of high specific output; but several years of practical experience, both in our own country and abroad, has shown conclusively that solvent-refined oils are far superior to any oils previously available. The aviation industry, particularly, has demonstrated the better quality of solvent-refined oils as to leave no doubt that a marked improvement in operation has resulted from their use.

Field results must always be accepted as the final word in the evaluation of any change, whether it be oil refining or anything else. In the case of solvent refining, the field results over a period of four years or more, on a great variety of oils, have been remarkably consistent in substantiating laboratory predictions that solvent-refined oils were generally superior to acid-refined oils. We may now conclude that the superiority of solvent-refined oils is a proven fact.

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[1] C. Engler and H. von Hofer, *Das Erdol*, 1, 39 (1913).

Strength and Cost of Alloy and Carbon Steel Tubes

By W. L. NELSON

The use of alloy steel for cracking still tubes has become an accepted practice but little attempt has been made to classify the various alloys that are available. Some steels are so strong that they justify their higher cost because of strength alone, whereas other alloy steels are so expensive that they must have superior corrosion resistance as well as strength in order to justify their cost.

Alloy tubes are now widely used for the hottest or outlet part of the cracking-coil but they have not been used extensively for the cooler parts of the furnace or for topping plant furnaces. However, the following analysis of the value of alloy steel, indicates that alloy tubes may be economical in some instances even for the less severe conditions that are encountered in topping stills. These statements and those which follow are based on consideration of strength alone—and it is obvious that the superiority of some alloys to corrosive attack is a problem to itself and one that will depend upon the particular corrosion conditions. Some enterprising refiners have gone so far as to use three or four kinds of tubes in a single still.

Strength and Corrosion Resistance

There are two main reasons for adopting alloy steel tubes—namely, superior high-temperature strength or superior corrosion resistance. In addition there are indications that thin metal walls are better conductors of heat in commercial installations than is shown by the regular heat-transfer formations—that thick tube walls tend to cause the formation of coke. Conclusive results have not been obtained but studies of this problem are being conducted in several commercial installations. Another indirect advantage of high-strength (alloy) tubes is the smaller bends that may be used with smaller diameter tubes.

Although the superior strength of alloy steels has been one of the major reasons for their development, not until the last few years has strength data been determined for high-temperature conditions. At the present time there are considerable data concerning creep strengths at temperatures of 900 to 1,200° F. for tube steels and hence it is possible to study the economic value of these steels as a function of their strength. Steels for the extreme tube service of 1,000 to 1,200° F. have been developed commercially and are finding widespread use, but as yet there have been few steels that are developed for the lower temperature range of 800 to 900° F. It would seem that low manganese, low silicon, or a steel containing small amounts of these elements would have superior strength at 800° F., would not be too expensive, and might be easily fabricated. The lack of suitable steels for 800° F. service is due to the strange fact that the alloy steels that have superior strength at 1,000° F. are usually little better than carbon steel when used at 800° F. Carbon molybdenum steel is a good example. This steel is nearly three times as strong as carbon steel at 1,000° F. but has about the same strength as carbon steel when compared at 800° F.

The corrosion resistance of tube steels is not a property that can be studied with any certainty and hence the following discussion will be confined to a study of the value of strength in alloy steels as it is related to their cost.

Strength and Cost

The relative strength and cost of several tube steels is given in Table 1. Although the data given in Table 1 are an average from several sources they are only an approximation. The relative prices change each year because of constantly improving methods of manufacture and the greater tonnages that are produced, and likewise the strengths are being constantly improved by better production methods. The strengths were compared by means of the creep strength at 1,000° F. when permitting a stretch of 1 per cent in 10,000 hours of service (about 14 months). These are common conditions for cracking service. The temperature of 1,000° F. was adopted because the tube wall is at a somewhat higher temperature than the material being heated in the tubes.

Even a casual inspection of Table 1 indicates the approximate usefulness of the alloys. As an approximation, if the relative strength of an alloy is greater than its relative cost, then it will probably be economical to replace carbon steel tubes with alloy tubes. Thus, materials 2 and 5 are definitely strong materials for their price whereas the other alloys would probably have to justify their use by their superior resistance to corrosion. In other words, alloys 2 and 5 are useful because of their strength and the other alloys are notable because of corrosion resistance.

Design of Tube Thickness

Many formulas have been proposed for the design of tube thickness but from a practical standpoint, great precision or complicated formulations are not justified because extra thickness should always be provided to care for the contingency of scaling or corrosion. Thus if a tube were designed for strength alone, it would be useless even after a few days because it would loose thickness and become unfit after the first day of service. For this reason it has become common practice to design tubes by the simple Barlow's Formula and then add about one-eighth inch thickness to care for normal scaling and corrosion. In general, this

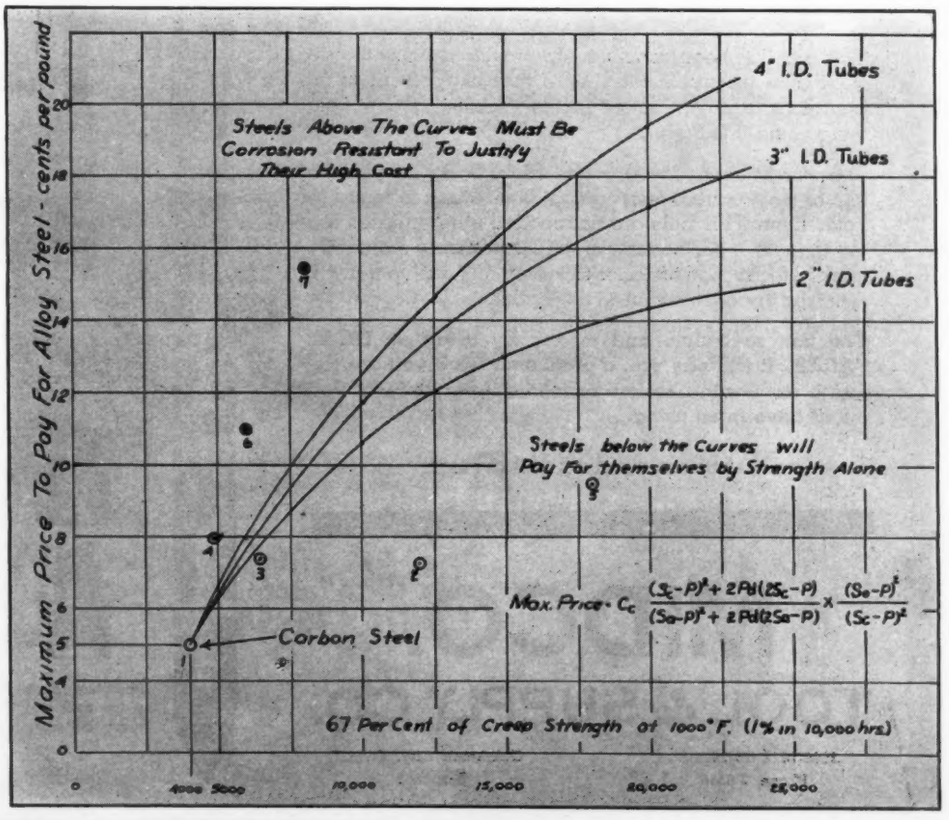

Fig. 1—Price for cracking still tubes based on strength alone

permits about one-fourth of the tube thickness to be lost by scaling before the tube becomes too weak for service.

Several formulae expressed in terms of the inside tube diameter, are:

$$\text{Barlow—} \quad t = \frac{Pd}{2(S-P)} = 0.33 \text{ inch}$$

$$\text{A.S.M.E.—} \quad t = \frac{d(P + 250) + .0785}{2(S-P-250)} = 0.51 \text{ inch}$$

Theoretically correct—

$$t = \frac{d}{2}\left(\sqrt{\frac{10S + 4P}{10S-13P}} - 1\right) = 0.28 \text{ inch}$$

In which:

t = thickness of tube wall, inches.

P = internal pressure, pounds per sq. in.

d = internal diameter, inches.

S = working strength of steel, pounds per sq. in.

The thickness given after each formula is based on a strength of 4,000 pounds per square inch, a pressure of 1,000 pounds per square inch, and an inside diameter of 2 inches.

In the computations given hereafter the following formula based on Barlow's form, but including additional thickness for normal corrosion, was used—

$$t = \frac{Pd}{2(S-P)} + 0.125 \qquad (1)$$

TABLE 1—APPROXIMATE COSTS AND STRENGTHS OF TUBE MATERIALS

No.	Type of steel—	Approx. composition Mo	Si	Cr	Ni	Cost—1937 Cents/lb.	Relative	Design strength (about ½ of creep strength)* Lb./sq. in.	Relative
1.	Carbon	....	....	....	...	5 0	1	4,000	1
2.	Carbon moly	0 5	....	....	...	7 3	1.47	12,000	3
3.	Silicon moly	0 5	1 5	....	...	7 6	1 53	6,400	1.6
4.	S.A.E. 4615	0 25	....	....	2 0	8 0	1 6	4,800	1.2
5.	1¼ Chrome moly	0 5	0 75	1 25	...	9 5	1 9	18,000	4.5
6.	2¼ Chrome moly	0 5	0 75	2 5	...	11 0	2 2	6,000	1.5
7.	5 Chrome moly	0.5	....	5 0	...	15 5	3 1	8,000	2 0
8.	18-8 Chrome nickel	....	....	18 0	8 0	56 0	11 2	17,000	4 2

*Creep strength—1% deformation in 10,000 hrs. at 1,000° F.

This is a conservative method of determining the thickness and in words, means that the tube will scarcely stretch or deform at all until its wall thickness has decreased by one-eighth inch and then it should last almost a year before becoming dangerously weak.

Cost of Tubes Per Foot of Length

By means of the above basic formula, several useful relationships were derived. Cost per foot of length $= \frac{\pi rc}{144}(t^2 + td) = 10.7c(t^2 + td)$ (2)

In which: r = density, lb. per cu. ft. = 490

c = cost of metal, cents per pound.

By introducing the value of thickness from Equation (1) and simplifying, the following equation of cost results:

$$\text{Cost per ft.} = 3.05cd\left(.5 + \frac{Pd(2S-P)}{(S-P)^2}\right) \qquad (2)$$

The price that you can afford to pay for alloy steel and have a more economical installation than carbon steel tubes is given in Equation (3). The subscripts, c and a, refer to carbon and alloy steels respectively.

$$\text{Maximum price to pay for alloy} = C_c\frac{(S_c-P)^2 + 2Pd(2S_c-P)}{(S_a-P)^2 + 2Pd(2S_a-P)} \times \frac{(S_a-P)^2}{(S_c-P)^2} \qquad (3)$$

This equation was used in preparing Fig. 1 which shows the price that you can afford to pay for alloy steel when the price of carbon steel is 5 cents a pound and when the general service conditions are those encountered in the hottest part of a cracking still furnace. The particular conditions that were used, are—

Pressure—1,000 lb. per sq. in.

Strength of carbon steel—4,000 lb. per sq. in.

Cost of carbon steel—5 cents per pound.

Figure 1 shows that steels 2, 3, and 5 are cheap at their present prices and that 4, 6, 7, and 8 must exhibit superior corrosion resistant properties in order to justify their high price.

Saving in Bends

In an indirect way, the use of alloy steel (or thinner tubes) also creates a saving in the cost of the bends. Due to the thinner tube wall when using strong alloy steels, the outside diameter is decreased and smaller cheaper bends may be used. However, bends are usually supplied in sizes differing from one another by one-half inch and hence a smaller bend cannot be used unless the decrease in tube diameter exceeds one-half inch.

An an approximation, the next size smaller bend can be used if the strength of the alloy steel is greater than the strength of carbon steel by the amount of the following factors—

	Strength of alloy carbon = 1.0	Approx. saving per bend
For 2-inch inside diameter tubes..	3.4	$4.00
For 3-inch inside diameter tubes..	1.8	4.00
For 4-inch inside diameter tubes..	1.5	5.00

Thus for the larger tube sizes, when used for high-temperature high-pressure service, a saving of about $4.00 per bend or tube can be accredited to the use of alloy steel tubes. An equation for determining the decrease in thickness that results from the use of a stronger alloy is—

$$t_c - t_a = \frac{Pd}{2}\left(\frac{1}{S_c-P} - \frac{1}{S_a-P}\right) \qquad (4)$$

(Continued on Page 108)

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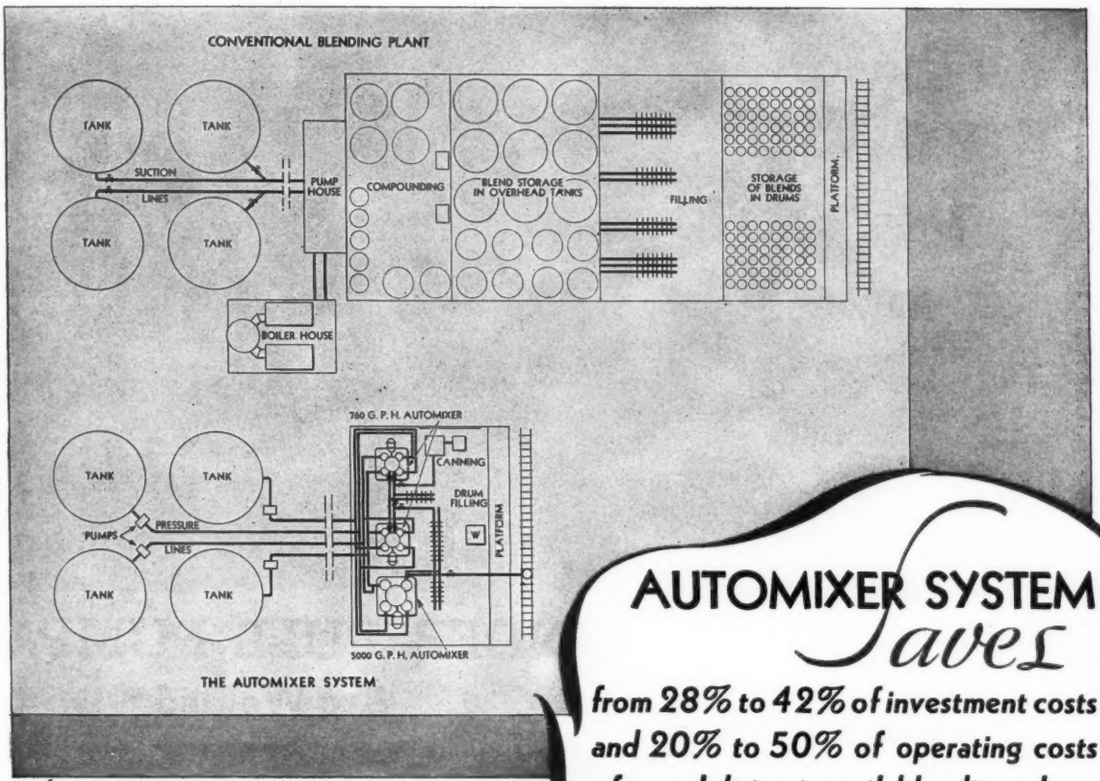

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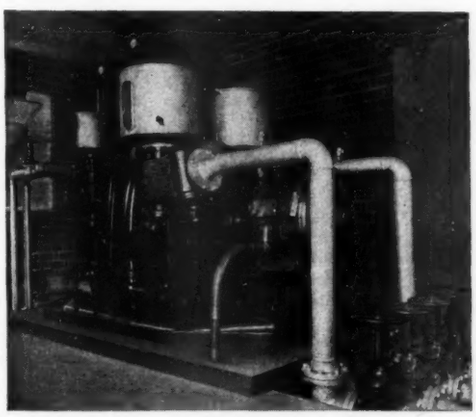

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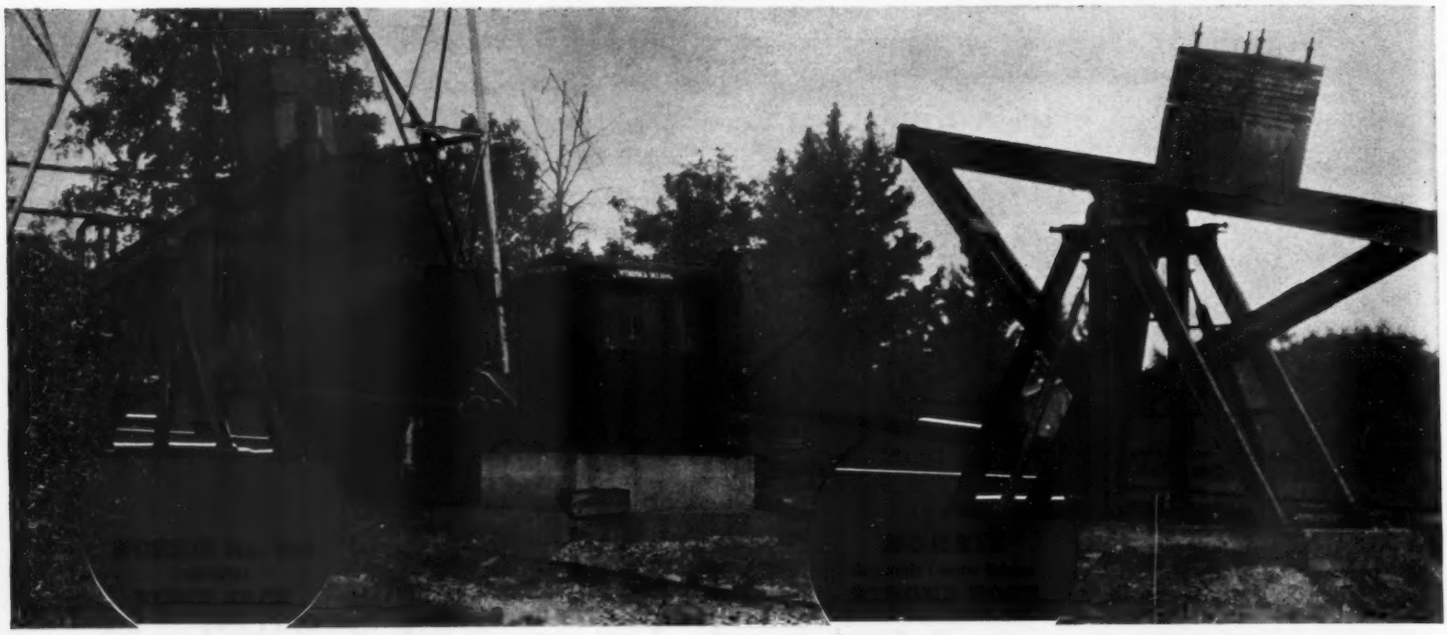

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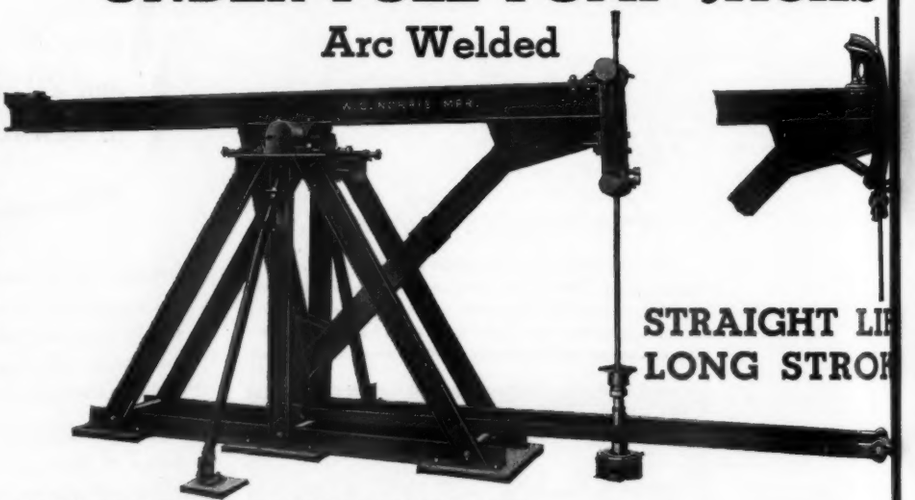

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PRORATION of Allowable Oil Production

By LYNDON L. FOLEY
Consulting Petroleum Engineer, Tulsa, Okla.

Commercial production of oil as a fuel began in the United States on completion of the Drake well near Titusville, Pa., in 1859. Crude oil from springs and seepages had been used for illumination and lubrication before this time, but had not been developed extensively.

Overproduction and Curtailment

The first overproduction occurred in 1861 on completion of several flowing wells yielding 2,000 bbl. to 2,500 bbl. per day. The price of oil declined to 5 cents per barrel, which was a great hardship to the oil and cooperage industries. A great many similar periods of overproduction, with ruinously low prices, have afflicted the industry, and have led finally to the restriction of production to market demand. This has been done by voluntary agreement of operators, by proration of purchases

A.P.I.—Presented before the mid-year meeting, June 1 to 3, Colorado Springs, Colorado

on the part of pipe-line companies, and by orders of state regulatory bodies.

Oil was transported originally in barrels, each producer hauling his own oil to market in wagons. Railroad tank cars were introduced by the Baltimore and Ohio Railroad in 1866. Pipe-line development began in 1865. A 60-mile line to Pittsburgh was completed in 1874, and the first pipe line to the Atlantic seaboard was completed in 1879. The development of oil-transportation systems grew beyond the means of small operators, and the control of transportation became an advantage which was sometimes used unfairly to the detriment of small producers of oil. It was inevitable that court decisions would protect small operators, and pipe lines engaged in the transportation of purchased oil were held to be common carriers, thus establishing the principle of ratable takings. This led also to proration of purchases by the pipe-line companies in times of overproduction.

State Regulatory Laws

The migratory nature of oil and gas in the ground was recognized by the courts,[1] and the so-called "law of capture" was applied to the ownership of oil and gas. The courts established in the case of The Ohio Oil Company v. Indiana[2] that the owners of oil lands could not operate wastefully to the detriment of their neighbors, and so established the police power of the states to prevent physical waste. The Corporation Commission of Oklahoma promulgated a proration order for the Cushing field in 1914, which was probably the first such order by a state regulatory body.

[1]Funk v. Haldeman 53 Pennsylvania 229; Brown v. Vandergrift 80 Pennsylvania 147; Westmoreland and Cambria Natural Gas Co. v. DeWitt 130 Pennsylvania 235.

[2]Townsend v. Indiana 147 Indiana 624; The Ohio Oil Co. v. Indiana 177 U. S. 190.

Curtailment by Proration

Ownership in Place. Granting the desirability of curtailing production to meet market demand, and granting that the states have the power to do so, there is still a wide range of opinion as to what constitutes equity in proration. Many people have held the opinion that proration should give each operator an allowable production proportional to his probable recovery under unrestricted production. This consideration led to the use of well potentials as the basis of proration. Restriction of production limits the individual's right to capture oil, and has led gradually to a recognition of the ownership of oil in place in the reservoir. The preponderance of opinion at present favors an allocation of allowed production which will give each operator an allowable production proportional to the recoverable oil under his land. This principle was recognized by the courts in the case of Brown v. Humble Oil and Refining Company,[3] in which the court held that the recoverable oil under a given lease in a developed field could be determined approximately by experts who can also determine equitably the amount of oil and gas recoverable by the owner of each tract under certain operating conditions.

Reservoir Energy. Restriction of production is desirable in many fields in order to prevent physical waste. Many fields utilize their reservoir energy more efficiently under restricted production. Conservation requires that the most efficient rate of production for such fields be determined, and that production be restricted to that rate. This restriction for conservation purposes necessitates an equitable allocation of the allowable production among the operators in the pool.

Open-Flow Tests. Open-flow tests of wells, called potential tests, have been the most commonly-used basis of proration, and have been considered to be the best index of the productivity of a well. A great many factors affect the productivity of a well. Among them are porosity, permeability and thickness of the pay sand, the reservoir pressure, the gas-oil ratio, depth of well, size of casing, etc. By measuring the flow of the well, we can determine accurately the net result of all of these factors. There are disadvantages in taking potential tests: equipment is required which is not needed for regular production, and open flow may be detrimental to the reservoir. Proration is based in some fields on initial potential tests which are adjusted periodically according to reservoir-pressure decline or according to an agreed monthly percentage decline. Efforts are being made to find a satisfactory substitute for initial potential tests, but nothing completely satisfactory has been found to date.

Well Potential. Well potentials may be considered an index of the productivity, or of the recoverable oil, of a well. Proration on a basis of well potential only may be satisfactory under the theory of giving each operator an allowance proportional to his probable recovery under unrestricted production. If well potentials are an index of recoverable oil, and *if well spacing is uni-*

[3]Brown v. Humble Oil and Refining Co. 83 SW (2d) 935. 87 SW (2d) 1069.

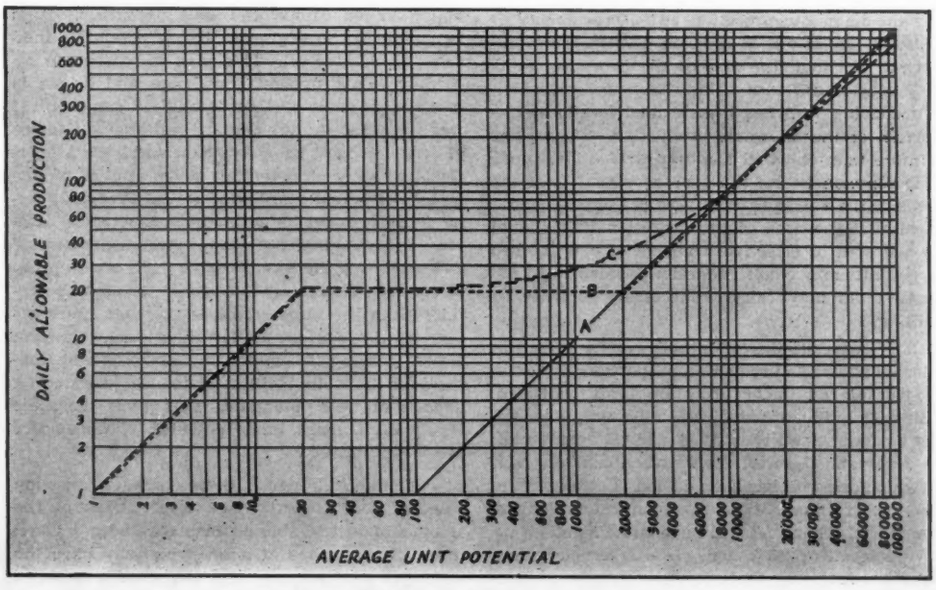

Fig. 1—Effect of minimum allowances

form, "straight-potential" allocation may give each operator an allowable production proportional to his recoverable oil. If well spacing is non-uniform, and we desire to give each operator a daily allowance proportional to the recoverable oil under his lease, it is necessary to use factors other than potential, especially the acreage factor.

Acreage Factor. Proration based solely on productive acreage has been used in some fields. This plan presumes that one acre is as good as another, and that reservoir conditions are uniform. This plan is equitable only if these conditions prevail. The wide range of productivity of wells, and the wide range of per-acre recoveries, indicate that these conditions do not prevail—even within a given oil field—and the so-called "straight-acreage" proration does not meet the requirement of allocating allowable production in amounts proportional to the recoverable oil under each lease. It does tend to discourage overdevelopment, as wells on small tracts receive small allowances.

Per-Well Proration. Proration on a per-well basis has been attempted. This is equitable only when reservoir conditions and well spacing are uniform, a combination of conditions which probably will never be found. Furthermore, oil wells do not produce oil. Oil is produced by oil reservoirs, and a pipe in a well transports the oil from the reservoir to the surface of the earth in the same manner that a pipe in a trench transports the oil from the lease to the refinery. The so-called well potential is the rate at which the reservoir can deliver oil to the surface of the earth through a given well. Proration of allowable oil production should be based on reservoir conditions. The sole function of an oil well, in the operation of a proration plan, is to indicate that a lease or proration unit is productive, and to indicate the relative productivity.

"Acreage Plus Potential." The first efforts to combine potential and acreage as proration factors evolved the so-called "acreage-plus-potential" plan. Under this system some portion of the daily allowable production is allocated to each operator in proportion to his share of the productive acreage in the pool. The balance of the allowable production is allocated to the operators in proportion to the potentials of their wells. A distribution of 50 per cent of the allowable production according to acreage and 50 per cent of the allowable production according to potential is used in a number of fields. One well will not drain an indefinite area and, obviously, the acreage factor per well must be limited. This is done commonly by dividing the field into proration units, presumably of uniform size so far as division of ownership will permit, although the size of the proration units may vary in different fields. Each unit on which a producing well has been drilled is allocated a portion of the allowable production of the field. If more than one well has been drilled on a unit, it is common to use the average potential of the wells as the average potential of the unit. It would seem that the area of the proration unit should be the area of effective drainage of a well. Too large units may cause under-development, and too small units may cause unnecessary expense of drilling.

The "acreage-plus-potential" system does not allocate allowable production proportionally to the recoverable oil under proration units or leases. This fact is illustrated by the following example. Let us assume two tracts, "A" and "B," containing 10 acres and 5 acres, respectively, and on each of which one well has been drilled. Let us assume that reservoir conditions are identical under the two tracts. Then "A" will have twice as much recoverable oil as "B"; and, since reservoir conditions are identical, the two wells may be considered to have equal potentials, say 1,000 bbls. per day each. Let us assume that the allowable daily production of the two tracts is 120 bbl., to be allocated according to the formula 50 per cent "acreage" plus 50 per cent "potential."

The result is as follows:

	Acreage Allowance	Potential Allowance	Total Allowance	Per Cent of Total Allowance	Per Cent of Recoverable Oil
Tract "A" ...	40	30	70	58 33	66 67
Tract "B" ...	20	30	50	41 67	33 33
Total	60	60	120	100 00	100 00

The discrimination in favor of the smaller tract is obvious. Furthermore, we have shown that "straight-acreage" proration is based on the theory that one acreage is as good as another. "Acreage plus potential" is based partly on that theory.

"Acreage Times Potential." Still following the theory that well potentials are an index of recoverable oil, a plan has been proposed which may be called the "acreage-times-potential" plan. The product of well potential and productive acreage is used as a factor, and each lease or unit is allocated an allowable production proportional to this factor. On leases or units having more than one well, it is common practice to use the average potential of the wells on the unit as indicating the average productivity of the unit. This plan gives each lease or unit a per-acre recovery proportional to the average unit potential, and is equitable to the degree to which well potentials indicate recoverable oil. It may be illustrated by using the same tracts "A" and "B" which were used to illustrate "acreage plus potential."

	Acreage	Potential	Acreage Times Potential	Allowable Production	Per Cent of Allowable Production	Per Cent of Recoverable Oil
Tract "A" ..	10	1,000	10,000	80	66 67	66 67
Tract "B" ..	5	1,000	5,000	40	33 33	33 33
Total ...	15	2,000	15,000	120	100 00	100 00

In this case each tract receives a share of the allowable production which is proportional to its share of the recoverable oil. The ideal case used as an illustration indicates that "acreage times potential" is more nearly equitable than "acreage plus potential."

The "acreage-times-potential" formula gives each tract a per-acre recovery proportional to well potentials or to average unit potentials. It is equitable to the degree to which potentials indicate recoverable oil. This plan is reasonable according to our present knowledge, and its use is much more common than is realized generally. If wells are spaced uniformly, with the same number of acres per well, the proration factors are proportional whether all potentials are multiplied by one or by the actual number of acres. Proration factors, proportional to "acreage-times-potential" factors, are obtained by using "straight potential" and neglecting the acreage *when wells are uniformly spaced.* Therefore, the use of "straight potential" gives the same result as "acreage times potential" if wells are uniformly spaced. Uniform 10-acre spacing is common in Oklahoma and Kansas, and the wells in these states are prorated on a basis of well potentials. This gives the same result as "acreage times potential" with 10-acre proration units.

Permeability Factor. Some engineers question whether well potential is a direct index of the amount of recoverable oil in place under a given unit. Two portions of a reservoir may have the same per cent porosity and the same amount of oil in place, and yet have different well potentials if the permeability varies. A greater permeability will doubtless permit the recovery of a greater portion of the oil in place, but some engineers question that the increase in recovery is proportional to the increase in well potential with increased permeability. They question that a well potential of 10,000 bbl. necessarily indicates 10 times as much recoverable oil as a well potential of 1,000 bbl. It has been suggested that we use the square root of the well potential ($\sqrt{P}$) as a proration factor However, we do not know the exact relationship of permeability and recovery, so the selection of the square root or any other root of the well potential as a proration factor would be purely arbitrary.

Reservoir Pressure. In some fields in which well potentials are used as proration factors, reservoir pressures are used as a safeguard against inequities. Periodic pressure surveys are made; and rated well potentials, determined originally by flow tests, are adjusted in proportion to changes in reservoir pressure. In this manner wells showing greater than average pressure decline have their allowable production reduced, and those showing less than average pressure decline have their allowable production increased. This is good production practice, as it prevents the formation of low-pressure areas which tend to drain surrounding areas of higher pressure, and which tend also to permit uneven encroachment of water. Pressure adjustments may not be a complete safeguard against unequal drainage, particularly in reservoirs of high permeability. This is shown by the fact that a well which is shut in completely may have the same pressure decline as surrounding wells which have produced oil, if the reservoir is sufficiently permeable.

Acreage and Reservoir Pressure. Some fields have been prorated on a basis of acreage and reservoir pressure. For example, in the Monument Field, New Mexico, 80 per cent of the allowable production is allocated on an acreage basis, and 20 per cent according to reservoir pressure. The allocation according to acreage presumes that one acre is as good as another, which is unlikely as discussed under "straight acreage." The use of the reservoir-pressure factor may tend to equalize drainage. However, it is doubtful whether the pressure factor is given sufficient weight in the formula. Probably the formula would be better if acreage and pressure were multiplied, and the product used as a proration factor. As the formula is now applied, wells equally spaced would have equal allowances initially. Suppose that two wells, equally spaced, have initially equal reservoir pressures and equal allowances; then, if the reservoir pressure under one well declines 50 per cent, its allowance would be 90 per cent of the allowance of the well with a higher reservoir pressure. A 10-per-cent decrease in allowable production with a decrease of 50 per cent in reservoir pressure is probably an inadequate adjustment. A well in a uniform spacing pattern, and having a reservoir pressure equal to one-half of the average pressure, would have one-half of the allowance of an average well if this type of proration were based on "acreage times pressure" instead of "acreage allowance plus pressure allowance."

Reservoir Energy. Recognition of the importance of reservoir energy, and its vital role in oil production, have led to the proposal of proration plans based on reservoir energy. Such plans are designed to permit each operator to use his proportionate share of the total energy of the reservoir. Some such plans propose that allowable production be stated in terms of total reservoir displacement, whether this displacement be caused by production of oil, free gas, water, or any or all of these fluids. The owner of a lease in the gas cap or the gas area of a field has certain property rights, and the right to realize on his investment.

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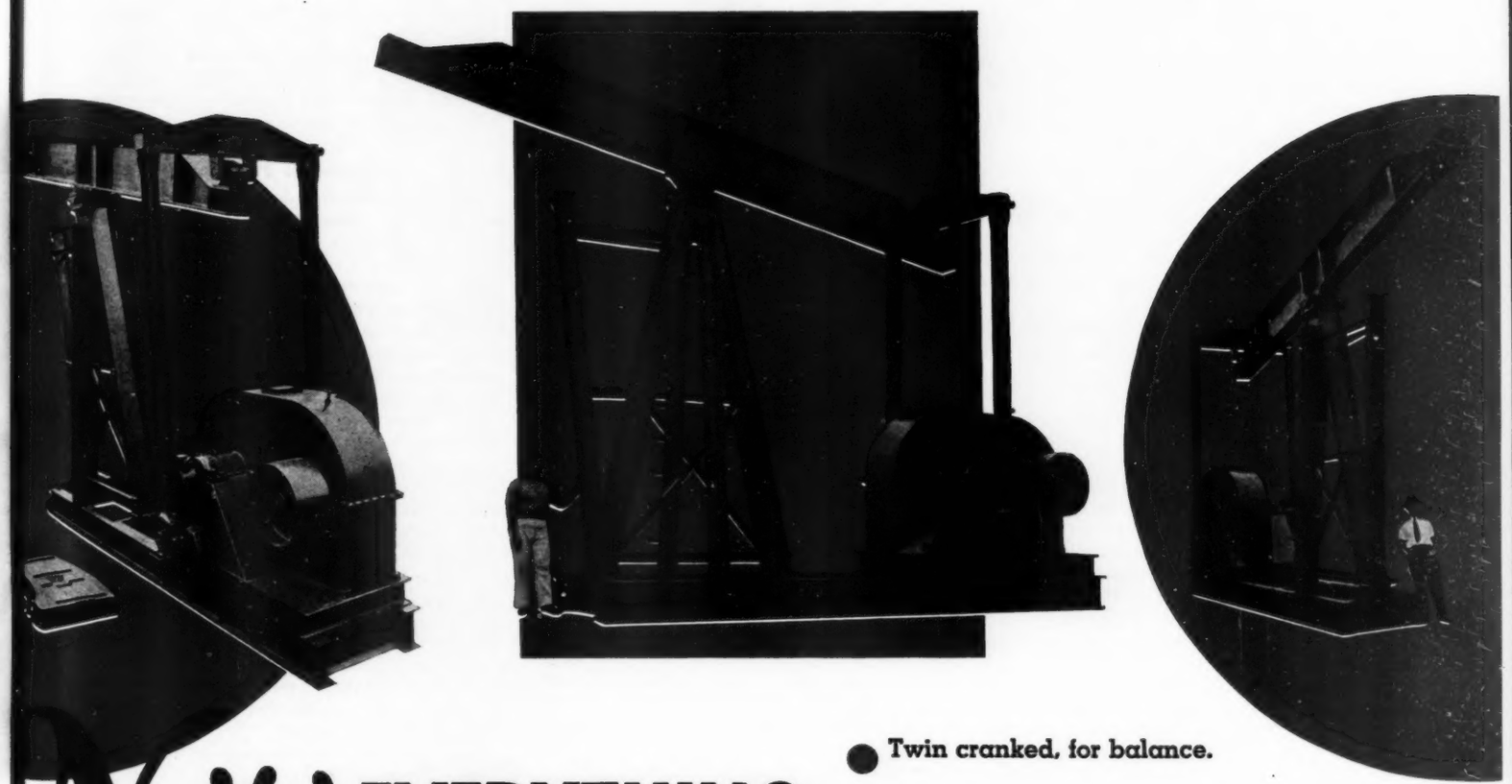

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At the same time, production of this gas diminishes the energy available for driving oil into the oil wells. All of the oil which is capable of moving out of a given volume of reservoir rock is recoverable oil. If it moves into an oil well, it is recovered. If it moves into a dry gas sand—replacing gas which has been removed—at least part of this recoverable oil adheres to the dry sand, and is never recovered. It is highly desirable, considering the pool as a whole, to retain the free gas in the reservoir until the recoverable oil has been produced, after which the gas may be produced and marketed. Attempts have been made to balance the rights of gas owners and oil owners by unitization of common reservoirs, by cooperation of operators, and by consideration of reservoir energy in proration plans.

Minimum Allowance

It is common practice to designate a minimum allowance below which no well may be restricted. This minimum may be established by law, or by commission order, or by custom. The minimum allowance commonly varies with the depth of the wells. The minimum allowance is applied in two ways:

1. A trial factor is determined by dividing the allowable production of the field by the total of the proration factors of all leases or units in the field. The factor which would give the minimum allowance is determined, and the minimum allowance is assigned to all leases or units having factors less than the minimum factor. The allowances of leases or units having minimum allowable production are then subtracted from the total allowable production of the field; the total of the proration factors of the minimum tracts is subtracted from the total of the proration factors of the field; and the remainders are divided. This gives the final factor to be applied to the proration factor of each tract receiving more than the minimum allowance.

2. The minimum allowance is given to each lease or proration unit in the field. The total of the minimum allowances is subtracted from the total field allowable production. The remainder is distributed to all of the tracts in proportion to their proration factors, and is added to the minimum allowance previously assigned.

The relative effects of the two methods of applying minimum allowances is indicated by the following example illustrated in Fig. 1. Let us assume a field having 100 proration units, prorated according to average unit potential, the total of the average unit potentials being 1,000,000 bbl. per day. Let us assume that the minimum allowance is 20 bbl. per unit, and that the field allowable production is 10,000 bbl. per day. Also that 10 units, having a total potential of 156 bbl. per day, are unable to make the minimum allowance; and 25 units, having a total potential of 39,000 bbl. per day, must be allowed not less than 20 bbl. per day each. Allowances are given in the nearest integral number of barrels.

If the allowable production were prorated strictly in proportion, the daily allowable production would be 0.01 unit potential. This relationship is shown by the solid line A in Fig. 1. A unit having a potential of 100 bbl. would be allowed to produce 1 bbl. per day; a unit of 2,000 bbl. potential would be allowed to produce 20 bbl. per day, etc.

First Method. The effect of the first method of applying minimum allowances in this example is as follows:

	Allowable Production	Average Unit Potential
Total of field	10,000	1,000,000
Less units not making minimum	156	156
Less units assigned minimum	500	39,000
	9,344	960,844

The factor applied to the average potential of each unit to determine the allowable production of the unit is:

$$\frac{9,344}{960,844} = 0.009,724,784,$$

which is slightly less than the factor 0.01 for strict proportion. The allowable production under this method is shown by the dashed line B. It will be seen that all units having potentials less than 2,057 will receive extra allowances, and all units of higher potential are penalized. All units of higher potential are penalized a fixed percentage of their allowances under strict proportion. A unit having a potential of 10,000 is penalized 3 bbl., or 3 per cent. A unit having a potential of 20,000 is penalized 6 bbl., or 3 per cent.

Second Method. The effect of the second method of applying minimum allowances is shown as follows:

	Allowable Production	Average Unit Potential
Total of field	10,000	1,000,000
Less units not making minimum	156	156
Total minimum allowances	1,800	.....
	8,044	999,844

The factor applied to the average potential of each unit is:

$$\frac{8,044}{999,844} = 0.008,045,255.$$

The result obtained by applying the factor is added to the minimum allowance to determine the allowable production of the unit. This is shown by the dashed line C in Fig. 1. Units having potentials up to 20 bbl. per day are allowed to produce to capacity. Units having potentials from 21 to 186 are allowed to produce 21 bbls. per day; units having potentials from 187 to 311 are allowed to produce 22 bbl. per day, etc. It will be seen that all units having potentials less than 10,000 will receive more than they would receive under strict proportion, and all units of higher potential will be penalized. The penalties are not fixed in percentage: a unit of 20,000 bbl. potential is penalized 10 per cent, while a unit of 100,000 bbl. potential is penalized 17.5 per cent. This is a striking contrast to the fixed 3-per-cent penalty under the first method.

Both Methods Compared. In comparing the two methods of applying minimum allowances, it will be seen that the first method gives a result closer to that of strict proportion, and all units penalized are reduced in the same proportion. All units having potentials from 20 bbl. to 2,100 bbl. per day receive the same allowance under the first method; but this is not a valid objection, since all of them receive more than they are entitled to receive. The second method of applying minimum allowances is more inequitable than the first.

Daily Allowable

Oil in place in the reservoir is moved into the wells by reservoir energy. When the reservoir energy has been exhausted, oil ceases to move—unless new energy is added, as in repressuring and water flooding. The end of the life of an oil lease has been commonly determined by the exhaustion of the reservoir energy rather than by the exhaustion of the oil. If a lease is not developed until the reservoir energy of the pool has been dissipated by other producers, dead oil is left in the reservoir under the lease in question. Dissipation of reservoir energy by other leases may reduce the recoverable oil under a lease, even though there is no drainage of oil in place. The same principle applies to a lesser degree if a lease produces less than its fair share of the field outlet. Oil lands are valued commonly in terms of recovery per acre, and are purchased and sold on that basis. Anything which affects the recovery per acre of an oil property affects correspondingly the value of the property. A proration order which restrains an operator from recovering his share of the current production will prevent him from recovering his share of the recoverable oil of the field, and will result in confiscation of his property. The daily allowance of a lease or proration unit must be proportional to the recoverable oil under it if each lease is to recover its share of the recoverable oil by the time the reservoir energy is exhausted. The daily allowable production should be stated in terms of recovery per acre per day, since this figure determines the ultimate recovery per acre in a prorated field. The opinion of the court in the case of Boxrollium Oil Company v. Smith[4] contains a very significant statement: "its allowable production is larger per acre than the allowable production of the wells of others on larger tracts in such fields." Note particularly the words of the court, "*its allowable production is larger per acre.*"

Equitable Proration

Equitable proration demands that each lease or proration unit must recover its own recoverable oil. It is necessary to determine an index of the recoverable oil of each tract in order to accomplish this. Well potentials are used most commonly for this purpose. The use of bottom-hole flowing pressures has been suggested, but they are not yet understood sufficiently to apply them in a proration plan. Sometimes well potentials are used with periodic adjustments to equalize reservoir pressures. Sometimes a uniform per-well or per-acre allowance is adopted initially, with periodic adjustments according to pressure decline. This plan presumes that inequities will show up as areas of abnormally high- or low-pressure decline, and that inequities of the original per-well or per-acre plan will be corrected as they develop.

Index of Recoverable Oil. The "index of recoverable oil" which is considered to be applicable should be multiplied by the acreage of the tract to determine the proration factor. The proration factor so adopted will give a recovery per acre which will be proportional to the adopted "index of recoverable oil." The following general proration formula is proposed:

Proration factor (Pf) = acreage of unit times index of recoverable oil

$$\text{Allowance of unit} = \frac{\text{Field allowance} \times Pf \text{ of unit}}{\text{Total of } Pf \text{ of all units}}$$

This general formula will give every proration unit a per-acre recovery proportional to its "index of recoverable oil." The equity of the formula depends on the accuracy of the "index of recoverable oil." The degree of fairness of its application will increase as our knowledge of indices of recoverable oil increases. A perfect "index of recoverable oil," used in this formula, will give each proration unit a daily per-acre recovery proportional to the recoverable oil under the unit. Continued application of the formula, with a perfect "index of recoverable oil," through the life of the field will give each tract the recoverable oil under that tract. Increased knowledge of the principles of well spacing may be applied to this formula by changing the unit size, or by additional drilling if the units appear too large. The proposed formula is perfectly flexible, and provides for improvement in proration technique as we increase our knowledge of the mechanics of oil reservoirs.

Summary

Various proration plans may be rated as to fairness as follows—the standard of equity being an allocation proportional to the recoverable oil under each lease:

Per-well allowances—equitable only if well-spacing and reservoir conditions are uniform.

Straight potential—equitable only if well spac-

[4] 4 Fed. Supp. 624.

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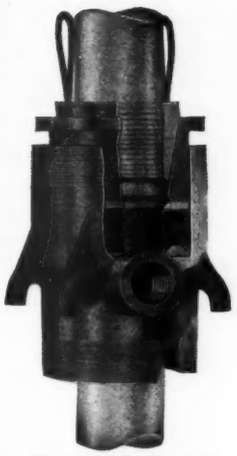

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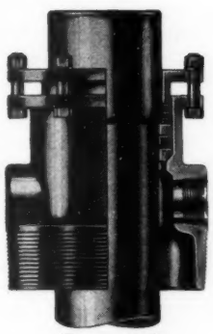

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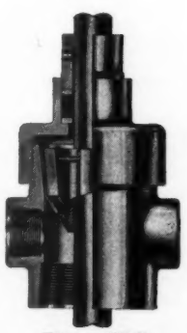

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ing is uniform, and if well potentials are proportional to recoverable oil in place in the drainage area of each well.

Per-acre allowances—equitable only if reservoir conditions are uniform.

Acreage allowance plus any other allowance—will not give allocations proportional to the recoverable oil under a lease.

Acreage times potential—equitable only if potentials are proportional to the recoverable oil under a lease. This plan gives each lease a per-acre recovery proportional to the well potentials.

Acreage times index of recoverable oil—equitable if the index of recoverable oil is accurate. This plan gives each lease a per-acre recovery proportional to the index of recoverable oil, and is reasonable in the light of our knowledge of indices of recoverable oil at any given time it may be applied.

The application of a reservoir-pressure factor to any of the above proration plans may correct wholly or partly any inherent inequity of the plan.

It must be emphasized most strongly that any factor which is considered indicative of the recoverable oil under a lease or proration unit must be multiplied by the acreage of the tract to determine the proration factor. It is only in this way that a daily allowable production may be assigned which will give each tract an ultimate per-acre recovery proportional to the "index of recoverable oil" of the tract.

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At our Baltimore refinery the straight-run and cracked gasolines are debutanized before sweetening or storage. The stabilized 4-lb. Reid-vapor-pressure base gasolines are stored in normal tankage, while the recovered and purchased natural gasolines are stored under pressure. The base and light gasolines are blended in the line as they are loaded. The ratio of light to heavy gasoline is automatically controlled by means of a ratio flow controller.*

A ratio flow controller is a composite instrument consisting essentially of a flow meter and a flow controller so related that the rate of flow in a primary line as measured by the flow meter determines the rate of flow in a secondary line by setting the flow controller which actuates a control valve in the secondary line.

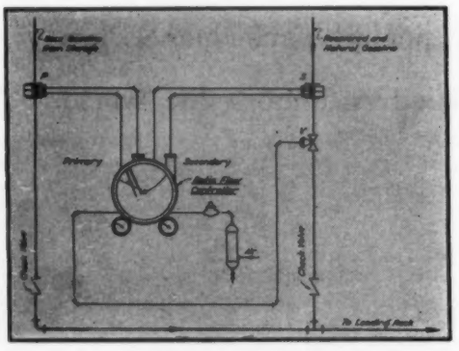


Fig. 1—Ratio flow controller

Referring to Fig. 1, the primary side of the controller *C* is connected through differential-pressure lines to orifice plates *P* in the various base-gasoline lines. The secondary-differential-pressure lines connect to an orifice plate *S* in the light-gasoline line, and the control mechanism connects to an air-motor valve *V* in the light-gasoline line. In operation, with the instrument set for the desired ratio of light gasoline, the pumps are started and the discharge line opened to the loading rack. The amount of base gasoline flowing through the primary orifice *P* establishes a pressure differential on the flow meter which, through the controller, opens the control valve *V* sufficiently to allow the correct amount of light gasoline to flow through the secondary orifice to establish the corresponding differential pressure.

By using the correct orifice plates, the controller can be set to blend any desired ratio of gasolines. The normal differential ratio adjustment in the instrument is set at 1 to 1. With this setting the blend is always proportional to the orifice coefficient ratio. It is possible, without changing the orifices, to adjust the differential ratio in the instrument to give a reasonably wide range of blends. Thus with orifice coefficients to give a 15-per-cent blend we have found the control accurate between 11 and 19 per cent. By quick-change orifices or by manifolding different lines, any desired ratio may be used. We have operated at from 5 to 25 per cent of light gasoline.

In operation, the laboratory determines the desired blend of a given base and light gasoline. The loader is given the percentage blend and the exact resulting gravity. The loading line is opened to a single car, and loading started at low rate. The ratio controller is set to give the correct ratio of the two stocks, and the blend gravity checked. After the blend ratio has been established, the loading proceeds at any desired rate. Over a day's loading we find that the maximum variation in gravity after the first car is 0.1 deg. API. The variation in per cent evaporated at 150 deg. F., which is our control point, is 0.5 per cent.

In designing such an installation the pumps should be of the centrifugal type for pulsationless flow. The light-gasoline pump should be of such size that, under the maximum rate and pressure, there will be ample pressure drop across the control valve to give accurate throttling. If an extremely wide range of rates is desired, several control valves may be needed. Check valves must be installed in all lines to prevent backing up of different grades when the loading valves are closed.

*Foxboro Co.

***A.P.I.*—Presented before the mid-year meeting, June 1 to 3, Colorado Springs, Colorado**

Bradford Field Lease Sale

BOLIVAR, N. Y.—Joseph A. Bucher and sons, Francis and Joseph W., of Bolivar have purchased the Electric Gas Co.'s oil and gas properties comprising 800 acres, with 95 producing wells, in the King's Run district, town of Ceres, Bradford field, McKean County, Pennsylvania. This is the largest deal of its kind ever closed there, involving about $300,000.

With a daily oil production of 80 bbls., the properties also produce enough gas for lease purposes and to supply the town of Ceres through lines of the Columbia Gas & Electric Corp.

Joseph A. Bucher is vice president of the Crude Oil Corp. of America, the main offices of which are in Tulsa.

Frank R. Markley has been appointed to the position of manager of the industrial sales department of the Sun Oil Co. with headquarters in Philadelphia. Mr. Markley was formerly manager of Sun's foreign department in Philadelphia.

Strength and Cost of Tubes

(Continued from Page 98)

If the decrease exceeds 0.25 inches then a smaller bend can be used.

Actual Case

The total saving (except by resistance to corrosion) that may be accomplished by the use of alloy steel tubes is the sum of two factors, the saving in cost of tubes and the saving in bends. This may be expressed in mathematical form but the easiest method is to use the foregoing data and equations without combining them. An example of the saving that may be accomplished by the use of alloy steel will be illustrated by using the following common conditions. Carbon moly steel will be used.

Conditions:

Pressure—1,000 lb. per sq. in.
Temperature in tube wall—1,000° F.
Internal diameter—3 inches.
Cost of carbon steel—5 cents per lb.
Cost of moly steel—7.3 cents per lb.
Strength of carbon—4,000 lb. per sq. in.
Strength of moly steel—12,000 lb. per sq. in.

$$\text{Cost of carbon steel tube} = 3.05 \times 5 \times 3\left(.5 + \frac{1{,}000 \times 3\ (8{,}000—1{,}000)}{(4{,}000—1{,}000)^2}\right) = \$1.30 \text{ per ft.}$$

$$\text{Cost of moly steel tube} = 3.05 \times 7.3 \times 3\left(.5 + \frac{1{,}000 \times 3\ (23{,}000)}{(11{,}000)^2}\right) = \$0.71 \text{ per ft.}$$

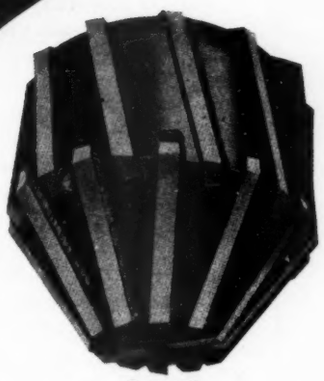
Saving for smaller bend = $4.00 per tube.

Thus when using 30 ft. tubes the saving per tube is:

Saving per tube = 30 (1.30—.71) + 4 = $21.70.

However, carbon moly steel does not resist oxidation as well as carbon steel, and hence the above saving is a little larger than that which would be found in practice.

THE INDUSTRY'S ACCEPTED SIDETRACKING TOOLS



Patented

5 REASONS WHY OPERATORS DEMAND THE KINZBACH WHIPSTOCK-MILLING TOOL COMBINATION

1. JUNKED HOLES: Set whipstock and sidetrack impossible fishing jobs with minimum loss of time and depth by milling out through casing and drilling around junk.
2. CROOKED HOLES: Straighten the hole by orienting and setting whipstock so as to mill out through casing in any desired direction at the depth deviation occurs.
3. WORK-OVER HOLES: Set whipstocks above clogged or collapsed liner or screen and sidetrack hole to new point in same sand or drill to new pay below.
4. PLUG-BACK HOLES: Sidetrack and mill out of casing at shallow pay horizon previously passed up, following depletion of deeper pay originally produced.
5. DIRECTIONAL DRILLING: The Kinzbach whipstock can be oriented for milling out through casing in any desired direction.

KINZBACH TOOL CO., Inc.
Manufacturers
HOUSTON, TEXAS
ALEXANDER ANDERSON, INC.
California Representative

KINZBACH MILL
ASSURES A CLEAN CONSISTENT WINDOW

Spiral setting of blades gives a uniform depth of cut, thereby minimizing danger of drill-pipe twist-off. Proper heat treating of the high speed tool blades permits grinding that provides the smoothest, most efficient cutting action. Kinzbach milling tools readily cut the new alloy casing and pipe. They pay for themselves in the round trips they save. The regular round nose type, illustrated, plus numerous other types, always in stock . . . or special mills for specific requirements are furnished.

KINZBACH WHIPSTOCK
ASSURES A MILL-OUT BETWEEN COUPLINGS

Set at any desired depth, requiring no support from bottom. Hinged feature assures reclining against pipe wall. By setting in a coupling, the window is always within one casing joint, eliminating any chance of parting casing string. Positive setting of slips prevents turning or downward movement. Can be oriented in hole to mill out any desired direction. Removable from hole, if desired. Made of alloy steels. The design assures a full, clean window, leaving no obstructions for follow-up drilling. For full details, see page 987, your 1937 Composite Catalog, or write direct.

"SOLD THROUGH LEADING SUPPLY STORES"

KINZBACH

Operating Kinks W
Prizes, N.G.A.A. I

Recognizing the value of operating ideas which have been devised by field men, the Natural Gasoline Association of America devoted most of the last day of the annual convention this year to discussing these "kinks" in open meeting in order that the industry might benefit from various ingenious methods for saving money in plant operation. The growing interest shown in the second annual kink contest this year indicates that the discussion of kinks is taking its place as one of the most useful features on the association's programs.

As T. R. Goebel, Shell Petroleum Corp., president of the association during the past year has pointed out, the kink sessions provide a forum where men closely connected with running gasoline plants can review innovations in their field.

The discussion was presided over by H. W. Harts, chief engineer of Natural Gasoline Corp., Tulsa. Prizes were awarded by a committee consisting of Anson W. Dwen, superintendent of gasoline department, J. E. Crosbie, Inc., Tulsa; J. R. Jarvis, manager, Lone Star Gasoline Co., Dallas; Vernon Wallace, engineer, refining department, Phillips Petroleum Co., Bartlesville, Okla.; and C. H. Smith, Kansas Power & Light Co., Salina, Kans.

Entries in the contest were judged in four classifications in order to have the prizes distributed over the principal phases of natural gasoline plant operation. These were as follows:

(a) Operation or maintenance of engines, compressors, pumps, turbines, electric motors, electric generators or boilers.

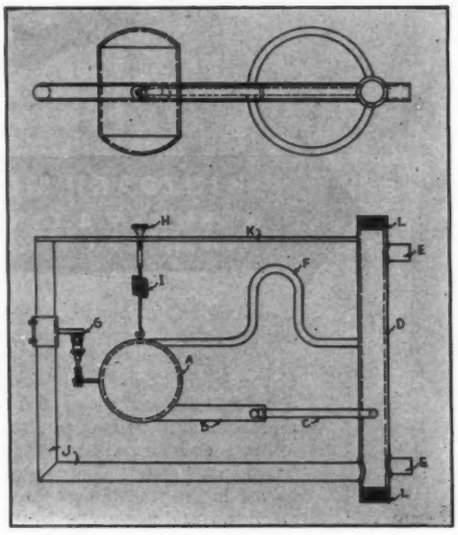
(b) Metering or other volumetric measuring; temperature controlling, pressure controlling, volume controlling, liquid-level controlling, laboratory equipping or operating methods.

(c) Gasoline or oil distillation; fractionation; gasoline absorption, condensation or cooling, gasoline or gas treating.

(d) Field pipe-line and other field operation and maintenance; gasoline storing; gasoline loading; special tools, labor-saving or safety devices; accounting or record-keeping methods; or any other phase of natural gasoline manufacture not covered within the preceding classifications.

A Grand Prize of $25 was awarded to the device showing the greatest originality and promise of usefulness. In each class a first prize of $15 and a second prize of $10 was awarded.

In the requirements for the contest it was specified that one clear drawing or photograph be submitted by the contestant. Operating ideas were presented most effectively when the originator of the kink explained his ideas personally before the meeting during the five minutes allotted to discussion. In cases where the originator could not be on hand, the presentation of the kink was done by an employe from the same company. The kinks awarded prizes are shown on this and the following two pages.



Liquid Level Control

GRAND PRIZE

NOEL L. DALTON, repairman
Phillips Petroleum Co., Edmond, Okla.

This control eliminates the use of a packing gland and is designed for the purpose of obtaining more accurate control at a lower cost for construction and maintenance. It is actuated by the increase and decrease of weight of the liquid being controlled as the level rises and falls in the reservoir "A." The device is designed to eliminate the effect of friction in liquid level control in order that the slightest variation of the liquid level may give a corresponding change of pressure to the diaphragm of the motor valve.

The elimination of the packing gland is of particular advantage in controlling the level of high gravity gasolines under high pressures. There is no float ball to collapse or leak. There are no threads or gaskets to leak. It can be constructed more cheaply than a kidney float. When made of the proper materials the maintenance will be negligible.

The level control is connected to the tank by 1½-inch connections from the threads marked "L" so that the desired level of the liquid will be near the center of reservoir "A." As the level rises in the pipe "D" it equalizes in reservoir "A," increasing the weight of the reservoir causing it to lower thereby operating the pilot valve assembly "G." As the level lowers in the pipe "D" and in the reservoir "A," the weight decreases allowing the reservoir "A" to be raised by spring "I," thereby operating the pilot assembly "G." The one-half inch copper tubing "F" and "C" connecting the reservoir "A" with the pipe "D" is flexible enough to give the desired movement to more than cover the entire range of the control.

In order to make adjustments to compensate for the difference in weight of different liquids on which the control may be used, such as water and gasoline for instance, an adjusting nut "H" is provided. This nut may also be used to change the level to any desired position, within the range of the control. The pilot valve assembly "G" is of the variable type, requiring little power to operate it.

On installations where process lag is encountered, this control has an advantage in the fact that there is no friction to retard its action. For example: Controlling the amount of reflux in a fractionator column by controlling the amount of cooling water through the overhead condenser with a liquid level control on the reflux tray.

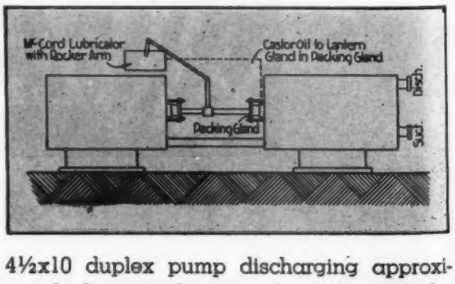
When using this level control on more viscous liquids such as oil, it will be necessary to use a suitable Sylphon bellows in place of the copper tubing "F" and "C." In all installations where the pressure on the liquid being controlled is below 100 pounds the Sylphon bellows would probably work much better than tubing.

Packing Lubricator

SECOND PRIZE, CLASS A

HUBERT WILLIAMS, chief operator
Phillips Petroleum Co., Pampa, Tex.

An old style rocker arm type 2-feed McCord lubricator has been installed on a 10x



4½x10 duplex pump discharging approximately 1 quart of castor oil per day into the packing for lubrication. With this practice it

Winning Meeting

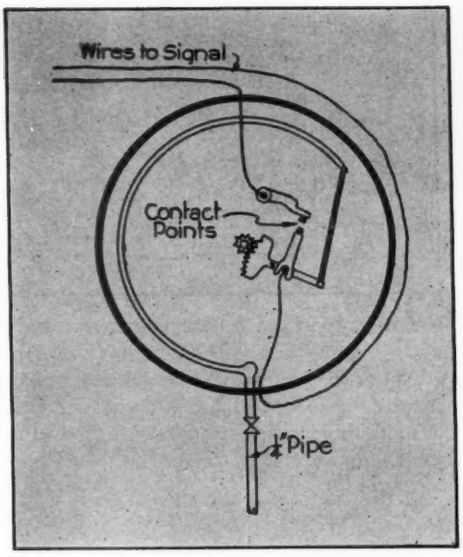
has been found possible to go four or five weeks without touching packing gland bolts for adjustment.

Signal Switch

SECOND PRIZE, CLASS B

A. E. McFARLAND, electrician
Skelly Oil Co., Carter Nine, Okla.

This switch was devised for a signal for a hot-well pump in order that operators would be notified at once when the pressure dropped below 30 pounds, thus making it possible to prevent filling the pump pit. In making this switch the face was removed from a 100-pound 6-inch face gauge. An insulated KW



point was installed above the arm that controlled the pinion. The point was connected to the negative wire. An insulated point was installed on the body of the gauge and connected to the positive wire so that the range of operation could be changed by shortening the link between the points. Gauge was put on dead weight and set to 30 pounds and when pressure was above 30 pounds, the contact on the circuit was open to a horn.

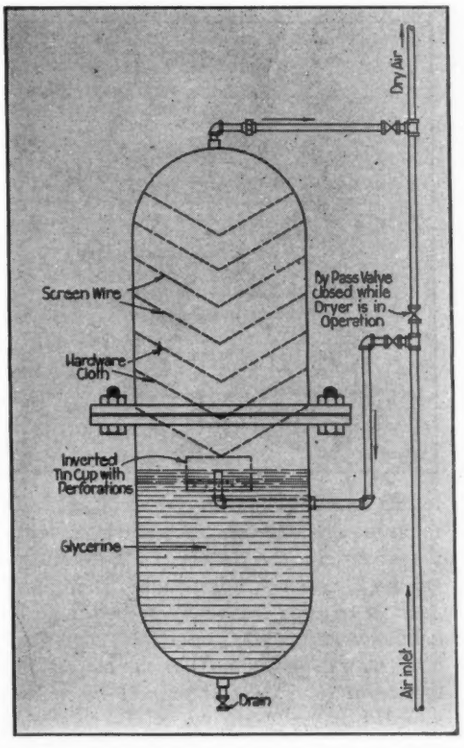
Air Dryer

FIRST PRIZE, CLASS B

H. E. CHAMBERS, chief operator
Skelly Oil Co., Lyman, Okla.

Interruptions due to freezing of moisture in air lines of control equipment have been eliminated by the use of this air dryer. Considerable trouble had been experienced in freezing weather when the shutting off of a control valve upset operations. A dryer was installed which removed moisture from air by the use of glycerin. Air coming from the dryer is so dry that no moisture collects in the drips at the controls. During the past winter, where the dryer was used, there was no freezing in the control air lines. The air dryer was installed in the open without protection. Even in zero weather it functioned satisfactorily; glycerin did not thicken excessively; and there was no trouble either with the operation of the dryer or with the air going to the controls.

The air dryer was installed on a set of



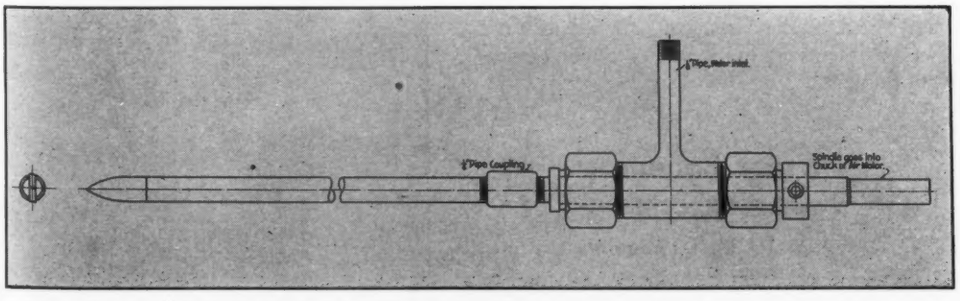
controls using 300 feet of air per day. There is a frost box around the line from the point where it comes out of the ground to the point where it enters the dryer. The dryer was made of material available in warehouse stock; two 6-inch bull plugs were flanged together; a one-half inch collar was welded in the side of the lower plug for an inlet; a one-half inch collar was welded in the top of the upper plug for an outlet. These were connected with the air line and equipped with shut-off valves and a by-pass with a valve. A nipple turned up at the end is connected with the inlet collar; a tin drinking cup (with perforations in the side near the open end) is

Rotary Drill for Cleaning Condenser Tubes

SECOND PRIZE, CLASS C

C. E. HAINES, plant superintendent, Shell Petroleum Corp., Orlando, Okla.

For cleaning condenser tubes a cleaner has been built which consists of a rotary drill with provision for a stream of water to wash away the cuttings and to cool the bit. This cleaner can be driven by an air motor, electric motor or by hand. At the plant where it is in use it is driven by an air motor to eliminate fire hazard since there is always a possibility of vapors being present. The cleaner body is chucked in the usual manner in the air motor; the proper length of drill stem and bit are attached and water hose is connected to the water body. Scale is cut from the walls and washed from the tube in one operation. With a bit properly shaped and ground very little power is required to drive the cleaner and both hard and soft scale can be removed with ease. It is advisable to use Stellite or some other hard facing steel on the cutting edges of the bit. Various length bits can be made for the different length tubes in



service. This tube cleaner has reduced the time used in cleaning by at least 50 per cent; furthermore it does the job better. The saving in production has been considerable especially when it is necessary to shut down a unit to be cleaned. A cleaning job that formerly cost $15 per cooler for labor now costs $7.50.

This rotary tube cleaner has been designed to clean tubes for all closed type condensers using water as a cooling medium. Results obtained over a period of years have shown that the cleaner is superior to the usual methods of cleaning condenser tubes with acids and by such mechanical means as the use of various types of bits and wire brushes.

inverted over it for a bubble cap. A quart and a half of glycerin just covered the perforations. Layers of hardware cloth and screen were spaced from the top of the dryer to prevent carry over of glycerin. On inspection after use, it was seen that the top layers of screen had no trace of glycerin on them.

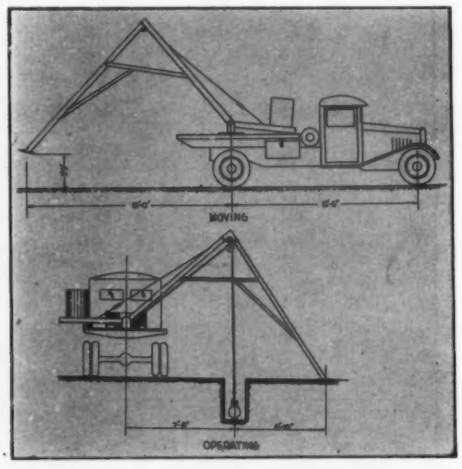
Six weeks after putting this device in operation, the glycerin solution measured more than the original amount used. This was distilled in a liter engler distillation flask until the temperature of distilled vapors rose to 300° F.; 95 per cent of the volume of the original glycerin was put back in the dryer and used for the last three months of winter.

Truck Derrick

SECOND PRIZE, CLASS D

S. H. MORRIS, engineer
Phillips Petroleum Co., Bartlesville, Okla.

The truck derrick or pipe jack was developed to facilitate the salvaging of buried pipe lines. The structure can be made of ma-



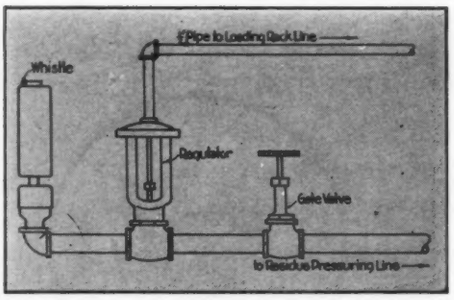
terials usually found in the scrap pile. The main requirement is a truck equipped with a power winch. The derrick can be built by a welder in about two days' time. The bearing used is a truck transmission bearing. The counterweight of 800 pounds weighs slightly more than the equipment on the other side of the bearing. The derrick can be quickly moved from point to point on the work. This was made and used in the Burbank field by the Phillips Petroleum Co. with a labor saving of 20 to 25 per cent on the lines salvaged.

Automatic Thief Alarm

FIRST PRIZE, CLASS D

B. F. GILSTRAP, chief engineer
J. E. Crosbie, Inc., Fittstown, Okla.

The pressure on the loading line through a one-half inch pipe holds the regulator closed. If the loading line is tapped, any drop of more than 2 pounds in line pressure will automatically allow spring tension of the reg-

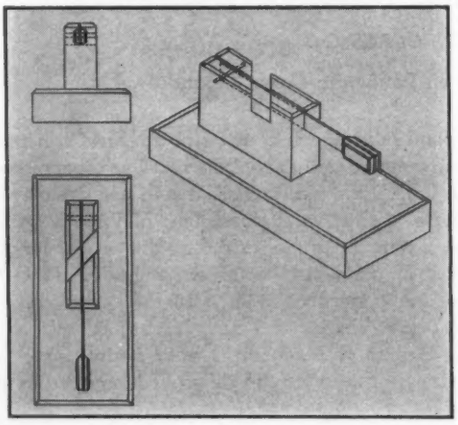


ulator to open valve, thus releasing residue gas pressure to the whistle. The regulator and whistle can also be used as a signal in loading, for the same action can be utilized when the loading rack man opens the gate at the rack, thus advising the stillman that he is ready to load.

Packing Cutter

NOEL L. DALTON, repairman
Phillips Petroleum Co., Edmond, Okla.

This device has been made for the diagonal cutting of centrifugal pump packing. The cutting is done with an old hack saw blade. This packing cutter is quickly and easily constructed from materials that are accessible around nearly every gasoline plant. It eliminates guess work in cutting packing and makes it possible to quickly and easily cut a



set of packing rings from coil or spiral packing with an accuracy approaching that of factory cut rings.

Water Softener

FIRST PRIZE, CLASS C

E. M. PARKIN, foreman
Glacier Production Co., Cut Bank, Mont.

All water in this plant with the exception of that used in the cooling towers is softened with a zeolite softener. This does not remove any of the mineral content of the water but simply changes all salts but those of sodium to sodium salts.

When water of this type is placed in a boiler, part of the sodium bicarbonate is changed to sodium hydroxide. Also, these salts tend to build up concentrations in the boiler until foaming is experienced if proper blowing down is not followed. Sodium hydroxide and sodium carbonate will react with the calcium and magnesium salts in hard water to form insoluble precipitates. We, therefore, started blowing the boilers of this plant into the cooling towers.

In doing this we have been able to precipitate most of the hardness in these towers. The precipitated salts settle in the basin of the tower where they are shoveled out yearly.

We are able to maintain water in the towers of 11 concentrations with less than the original concentration of hardness. The scale that is formed on the condenser tubes is soft, and may be removed with a small jet of water with a 50-pound water hose.

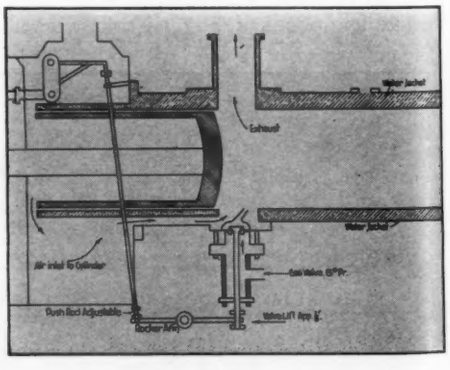
Previous to this treatment it cost 50 cents per day to inhibit this water with any of the materials on the market. Inhibiting, also necessitated running large amounts of water to the sewer in order to keep the concentrations within the limits set by the manufacturers.

Fuel Injector

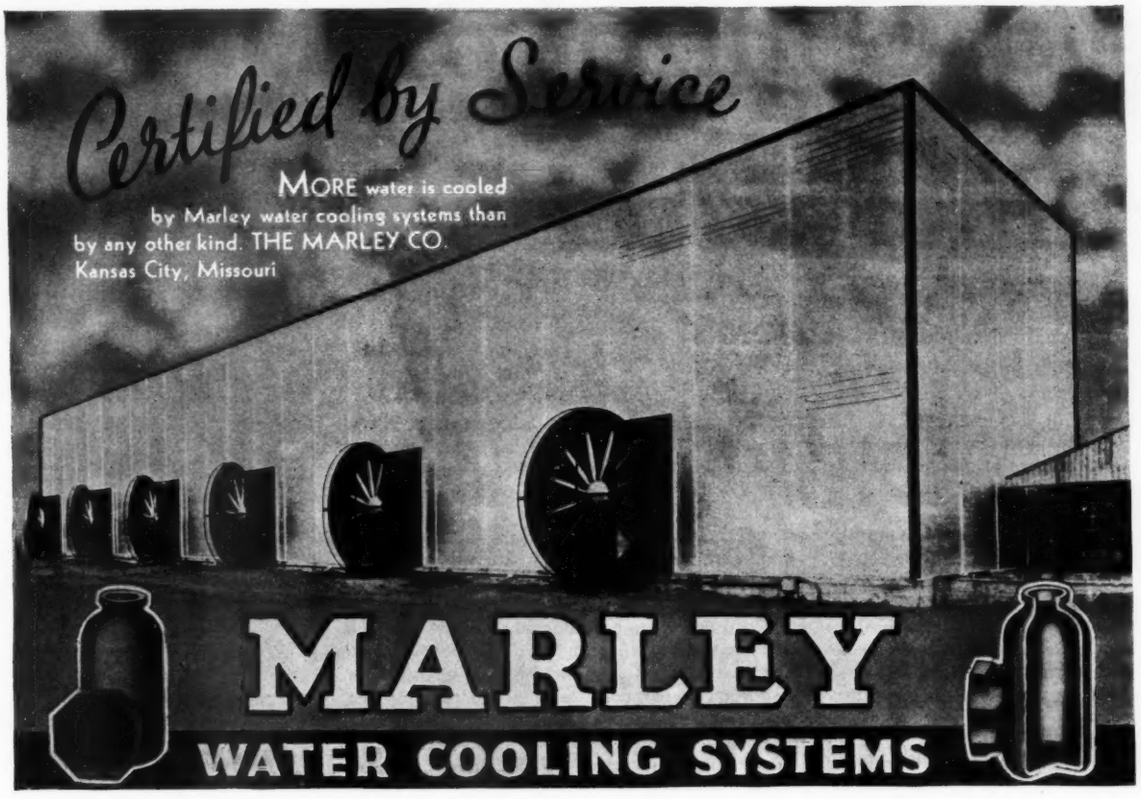
FIRST PRIZE, CLASS A

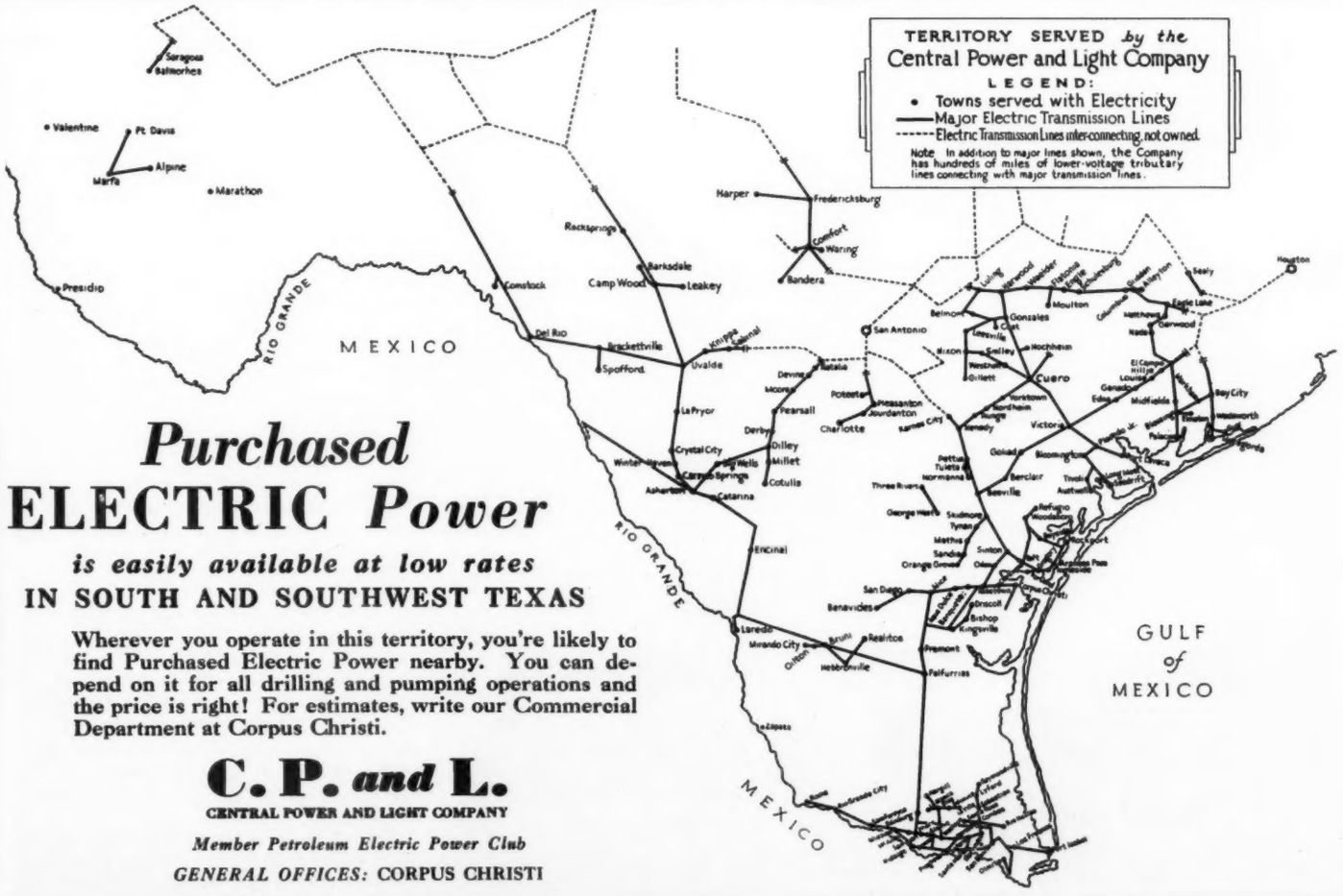
B. F. GILSTRAP, chief engineer
J. E. Crosbie, Inc., Plant No. 7, Fittstown, Okla.

This fuel injector provides for the injection of fuel through air intake ports. Expansion and contraction of the cylinder does not change adjustments, even though expansion and contraction may be as much as one-quarter inch. The injector has been designed for Type 10 G.M.A. or G.M.B. Bessemer 2-cycle gas engine with 17-inch inverted cylinders. Fuel pressure required is 13 to 15 pounds. Fuel valves are not in direct contact with fire and no water circulation is needed around them. It has been found that valves can operate over a longer period without grinding. Air and gas are injected into the



bottom of the cylinder forcing all burned gases out at the top of the exhaust. The fuel valve begins to open when the piston clears the ports three-eighths inch on the forward stroke and closes at the same position on the backward stroke. It has been found that this valve does not give trouble by getting out of adjustment.

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Electric Transmission Lines inter-connecting, not owned.
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GENERAL OFFICES: **CORPUS CHRISTI**

Field Control of Drilling Mud

By P. H. JONES
Union Oil Co. of California

The quality of drilling mud needed for any drilling project and the testing procedures required for the maintenance of this quality obviously are functions of the drilling conditions encountered. However, the organizations required for the field control of drilling mud fall naturally into two categories. The first involves the control of mud in individual wells located far from other drilling projects and established laboratory facilities, and the second has to do with control where a number of wells are being drilled in the same field or in fields sufficiently close together to permit the establishment of a single field laboratory for making mud tests.

Mud Control for Isolated Wells

In the control of mud used in isolated wells, it has been found advisable to provide, at the wells, instruments for making routine tests covering the weight, apparent viscosity, and sand content of the mud. Responsibility for making these routine tests

***A.P.I.*—Presented before the Pacific Coast Division of Production, Los Angeles, Calif., April 13**

can be delegated satisfactorily to members of the drilling crew, but in so doing it must be recognized that the prime function and major interest of the crew is to make hole. It is necessary, therefore, that particular attention be given to training the crew both as to methods of testing and the importance of mud control. Furthermore, it is necessary that the mud-testing apparatus be durable, simple to operate, and reasonably accurate. Also it has been found advisable to provide at each well a simple cabinet for housing the testing instruments.

Weight of Mud

The apparatus used for determining the density or weight of the drilling mud can be the well-known mud-weight hydrometer or constant volume bucket and spring balance. Both of these instruments have been used widely, and have rendered valuable service. However, it has been found that both are damaged easily or thrown out of adjustment so that unreliable results are obtained occasionally. In order to overcome these difficulties, a simple mud weight balance was developed which is illustrated by Figure 1. This instrument consists essentially of a constant volume cup that is attached rigidly to a graduated arm, the arm and cup being free to rotate in a plane perpendicular to a horizontal supporting knife-edge. The position of a slide on the arm can be adjusted to bring the cup and arm in balance, the arm being grooved to fit a V-shape projection on the slide so that when the slide is once attached to the apparatus it cannot be lost.

The instrument is so constructed and calibrated that when the system is in balance with mud in the cup, the position of the slide shows the relative density or weight of the mud as compared with water. It can, of course, be calibrated in any desired units, such as pounds per cubic foot, specific gravity, pounds per gallon, and so on. In making a test, the cover of the cup is removed, and the cup immersed in the mud stream to be sampled. The cover is then pressed into place, and any excess volume of mud above that for which the instrument was calibrated is forced out through a small hole in the top of the cover of the cup. The apparatus is washed under a stream of running water, dried roughly with a rag, and the weight determined immediately. This instrument has been found to be simple to operate, easy to keep clean, very durable, and accurate results can be obtained rapidly.

The role of mud weight in preventing drilling difficulties is a moot question. Obviously the weight must be sufficiently great to prevent blowouts from any high-pressure formations that may be encountered, but beyond this point the need for greater weight is problematical. There is considerable evidence indicating that heavy mud occasionally has value in preventing some formations from sloughing into the hole. A rapid reduction in the hydrostatic head maintained on formations, caused by a reduction in the weight of the mud or by permitting the level of mud in the well to fall while coming out of the hole, also may cause dangerous caving. More data covering the effects of hydrostatic head on caving formations are needed, and it is hoped that this discussion will promote a more general exchange of information covering this subject.

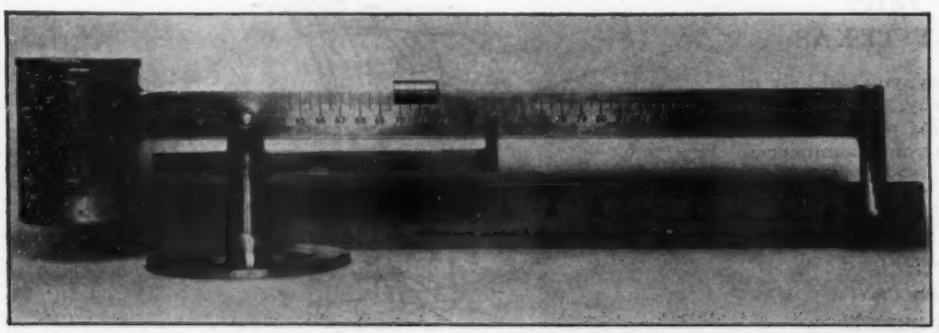


Fig. 1—Mud balance

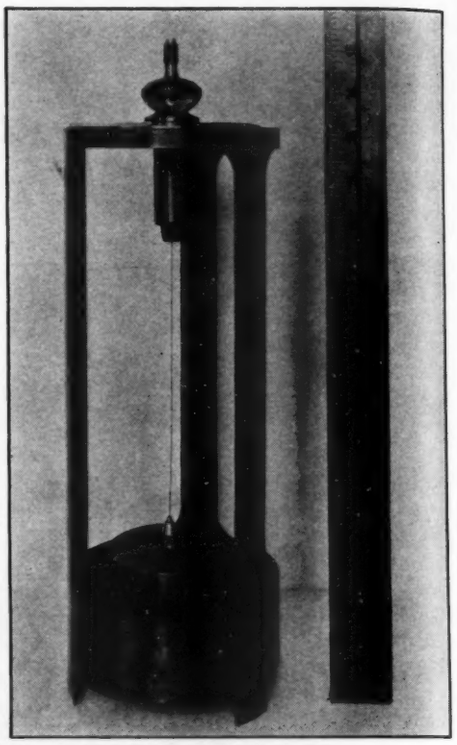


Fig. 2—Torsion shearometer

In general, the practice has been to keep the weight of mud only sufficiently high to prevent blowouts. Mud is always pumped into the well while removing the drill string to maintain a substantially constant hydrostatic head on the formations being drilled, and the mud weight is always kept as constant as practical. In a few cases weighted muds have been used in an effort to prevent caving and there has been some evidence indicating that this procedure occasionally has value, but the data are too meager to be conclusive.

Viscosity of Mud

Routine field determinations of the apparent viscosities of muds are made by the March funnel viscosimeter, which is so generally known that a description is not needed.[1] However, in order to simplify the measurement of the mud required for the test, a metal cylinder is provided in which an opening is cut at such a point that any mud in excess of the required 500 ml. will overflow out of the cylinder.

The data obtained with the funnel viscosimeter are empirical, and the prior history of the mud will influence greatly the results obtained. For example, in one case it was found that a sample of mud had an indicated funnel viscosity of approximately 45 seconds immediately after being taken from a ditch where it was flowing very slowly, whereas a viscosity of 30 seconds was obtained after agitation. Funnel viscosity determinations should therefore be made on samples that have been agitated or in rapid motion immediately before the tests are started.

Although a more precise instrument would be desirable, the funnel viscosimeter, in spite of its shortcomings, has proven a most valuable instru

(Continued on Page 119)

(Continued from Page 114)

ment in the field control of mud. The funnel viscosity of muds for most drilling conditions usually is kept at 28 to 40 seconds, and an effort is made to maintain the viscosity as constant as possible.

Sand Content of Mud

The sand content of the mud is determined by an elutriation method, using standard 100 ml. centrifuge tubes as specified by A.S.T.M. Method D 98-35. Twenty ml. of the mud to be tested is placed in the centrifuge tube which is then filled to approximately the 100 ml. mark with water, and shaken thoroughly. A one-fourth inch diameter copper pipe connected by a rubber hose to a small reservoir containing water is inserted in the centrifuge tube with the lower end of the pipe extending close to the bottom of the tube. Water is then passed through the centrifuge tube at a rate of approximately 200 ml. per minute until there is no further removal of sand particles. It has been found that this water rate can be maintained conveniently by equipping the lower end of the copper pipe with a brass capillary 1-inch long, drilled with a No. 54 drill, and holding the level of the water in the reservoir at approximately 16 inches above the top of the centrifuge tube. With a water rate of 200 ml. per minute, all particles somewhat finer than 200 mesh will be washed out of the centrifuge tube. When the washing has been completed, the metal tube is removed, the sand is allowed to collect in the bottom of the centrifuge tube, and its volume observed. This volume can then be converted to volume per cent of sand in the original mud.

No well-established limits for sand contents have been set, and it is probable that the upper safe limit is a function of the drilling conditions, the yield point of the mud, and the size of the larger sand particles. However, where relatively deep holes are involved, it is believed that the sand content should not be permitted to exceed about 5 per cent by volume of the mud in use.

Special Tests

The testing of mud in accordance with the procedures outlined is usually done by the derrick man who makes observations at least once a shift and enters the results in the driller's log.

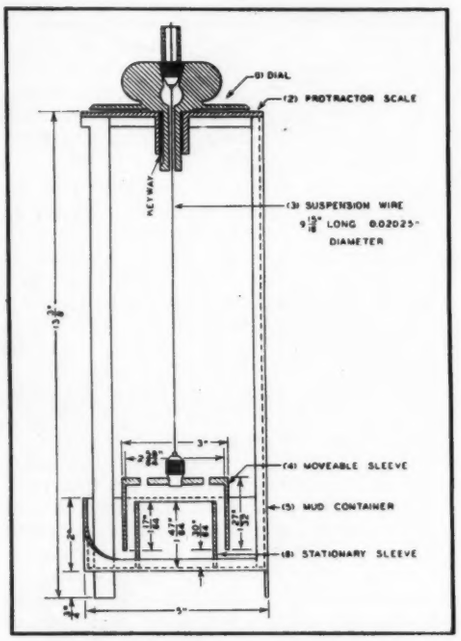


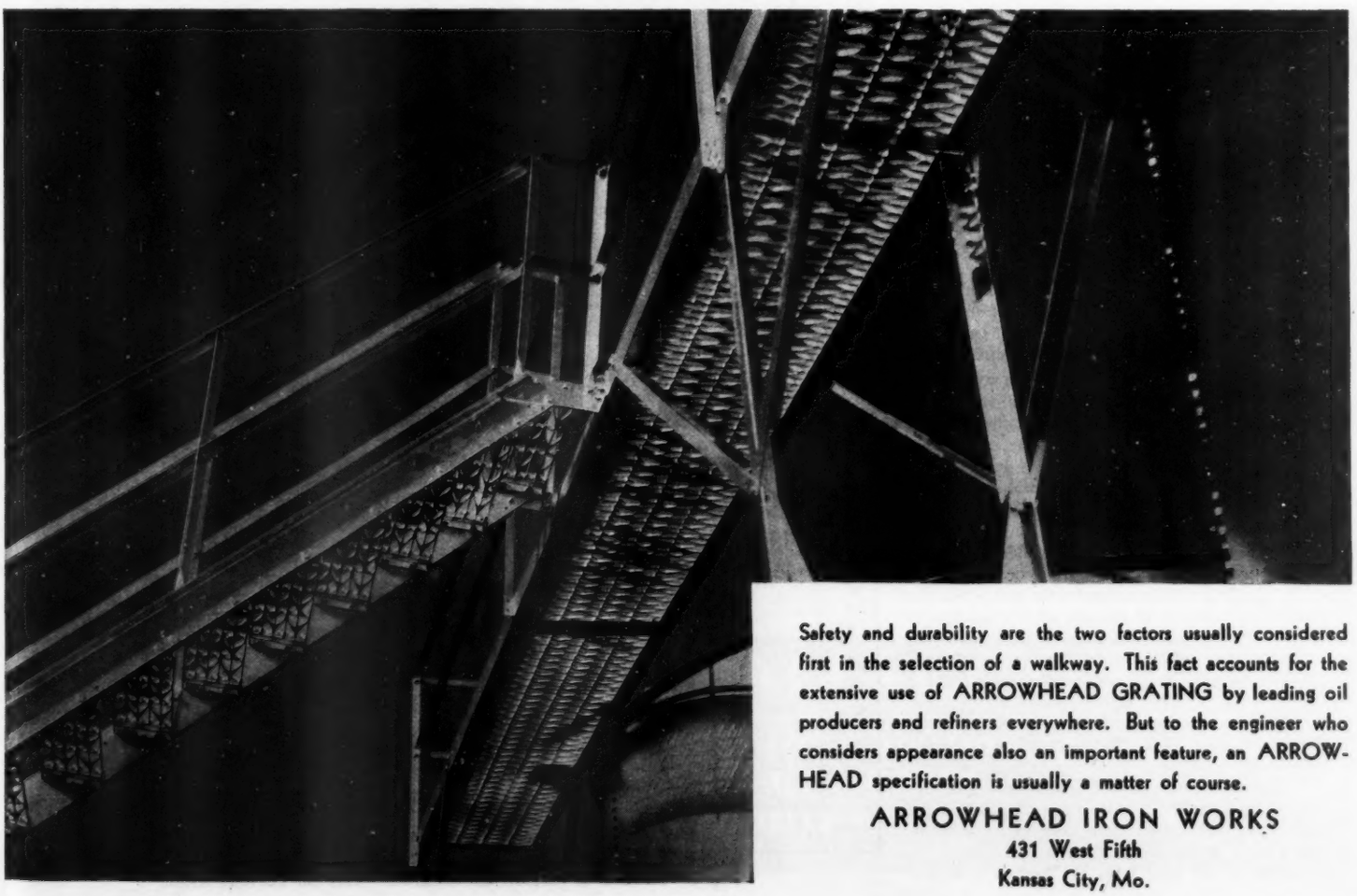
Fig. 3—Diagram of torsion shearometer

The routine field tests are made primarily to assist the crew in maintaining a constant mud quality and to provide a continuous record showing the general nature of the mud that has been used. When drilling conditions demand that special attention be given the mud, the routine tests are supplemented by inspections of a petroleum engineer or chemist who also cooperates with the drilling superintendent in determining and establishing the desired mud characteristics. In order to carry on this work the chemist or engineer is provided with portable equipment for determining the gel strength or yield-point of the mud and its performance characteristics with respect to its ability to prevent loss of water to formations drilled and the nature of mud cake deposited on the wall of the hole.

Yield Point of Mud

The yield-point of drilling mud is not necessarily constant but usually is a function of the agitation or time of standing quiescent to which the mud has been subjected previous to measurement, This property, by virtue of which the yield point of mud changes with agitation or standing, is known as thixotropy, and is a most important characteristic in that it influences greatly the size of particles which are able to settle out of the mud when circulation is stopped and the rate of settling of large particles.

Several methods for determining the yield-point of mud have been proposed and used with more or less success. However, some of the methods are unreliable, and in most cases the results can only be expressed in empirical terms. In an



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effort to overcome these objections the torsion shearometer, illustrated in Figures 2 and 3, was developed. It consists essentially of a movable sleeve (4) supported by a carbon steel wire (3), from a fixed support. When using the instrument, mud is poured into the container (5) where torsion may be applied to the movable sleeve by turning the dial (1), and the angle through which the

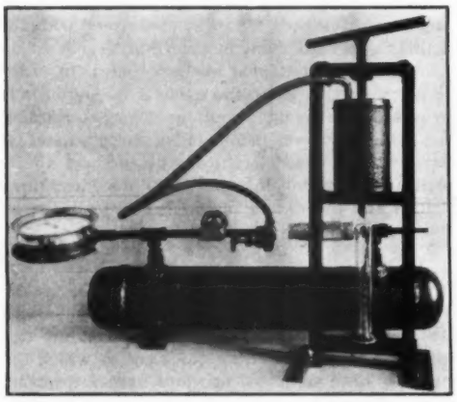


Fig. 4—Static performance tester

upper tip of the wire has been twisted when slippage occurs is read from the protractor (2). The yield point of mud may be calculated from the angle through which the dial has turned, the dimensions of the instrument, the dimensions of the wire,[2] and its modulus of elasticity in shear.[3]

Before making yield point determinations the mud is thoroughly agitated, preferably by stirring with a motor-driven egg beater, and placed in the instrument at about 80° F. The sleeve in contact with the mud is then moved up and down rapidly 30 times through an amplitude of about one-half inch, and a stop-watch is started. In order to obtain the yield-point after any given period of quiescence, the mud is allowed to stand as long as desired before beginning to apply the shearing stress slowly, which is accomplished by rotating the dial pointer attached to the upper end of the supporting wire at a rate of about 2° a second until the movable sleeve of the instrument shows the first definite sign of continued movement, when the watch is stopped. With the dimensions of the shearometer as shown in Figure 3, the yield point in pounds per 1,000 square feet of shearing surface is equal to 1.28 times the deflection in degrees. Figure 6 illustrates the general nature of the results that are obtained with this instrument.

The effect of the yield point upon the size of particles which can settle out of a quiescent mud was mentioned previously. However, the quantity of sand that can be removed in the ditch from even low yield-point muds has little practical significance. Screens or other desanding devices used on most drilling projects will remove all but the finest cuttings which in turn cannot be separated effectively from even low yield-point muds in the short, small cross-section ditches in general use. Thus little can be gained with respect to the removal of cuttings by the use of low yield-point muds. Conversely high yield-point muds and particularly those with high thixotropic properties are desirable because they will prevent the settling and packing of cuttings or cavings in the hole during periods of suspended circulation. On numerous occasions where "twist offs" have occurred, it has been possible to recover the pipe and drill assembly without undue difficulty even after the fish has been in the hole for several days where muds have been used that develop high yield-points on long quiescent standing. It thus seems advisable to use mud with the highest practical yield-point and thixotropic property consistent with the maintenance of nominal apparent viscosity.

Static Performance Tester

Many formations lose their structural strength and slough or cave into the hole when they are saturated with water, and one of the most important functions of a drilling mud is to prevent the loss of water to the formations through which the well is drilled. An apparatus for the evaluation of this property of mud was developed which permitted the circulation of the mud under test over an artificial sand formation at any desired temperature and pressure. However, this equipment is so large and complicated that it is necessarily a laboratory instrument.[4]

For field testing a much simpler portable apparatus called a static performance tester has been devised which gives results that permit mud evaluation comparable to those obtained by means of the laboratory apparatus. In using this static performance tester, which is illustrated by Figures 4 and 5, about 600 ml. of mud to be tested are poured into the reservoir (3) at 80° F. and the top of the reservoir is closed by a machined cap (2) which has a small hole (1) through which air is admitted. The bottom of the reservoir is closed by a sheet of filter paper (5) backed by a fine wire screen (6) and a perforated plate (7) which rests on a grooved bottom plate (8). Water forced through the filter media is collected and measured in the graduated cylinder (9), and during a test the assembly is held together by means of a screw press (4). Filter paper instead of a sand filter bed was used after numerous tests failed to show a difference in the results obtained with the two media. A pressure of 100 pounds per square inch gage and a test period of one hour were found to be satisfactory for the evaluation of most muds.

For the operation of this apparatus in the field where a supply of compressed air is not available, a small air reservoir which can be filled at any service station supplies the necessary pressure. After expiration of the one-hour test period, the apparatus can be disassembled and the thickness and texture of the mud cake determined. Typical results obtained with the static performance tester are shown in Figure 7. Generally muds that permit the loss of large quantities of water will deposit tough, thick mud cakes, and those that prevent the loss of much water lay down thin gelatinous cakes.

The static performance tester has been used over a sufficient period of time to indicate that at least a general relationship exists between drill-

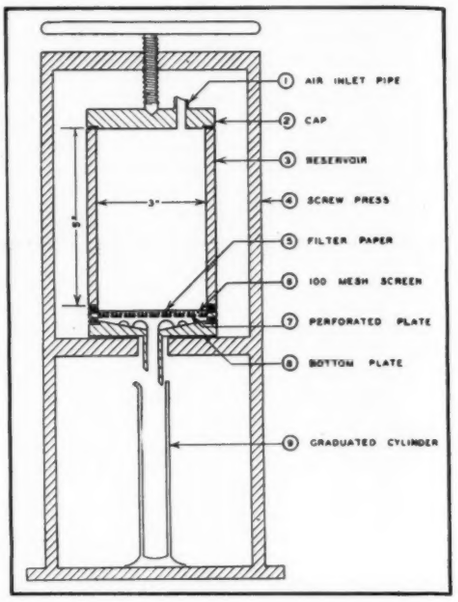


Fig. 5—Diagram of static performance tester

ing difficulties caused by caving or sloughing formations and the quality of mud as indicated by the results of tests with this apparatus. The muds in use in most deep or difficult drilling projects are tested as frequently as possible, and when the tests show that the quality of the mud has deteriorated materially, the mud is either replaced with a high quality mud or treated to restore its performance characteristics.

Mud Control of Centralized Wells

At one Southern California field where four or more drilling projects are in operation continuous-

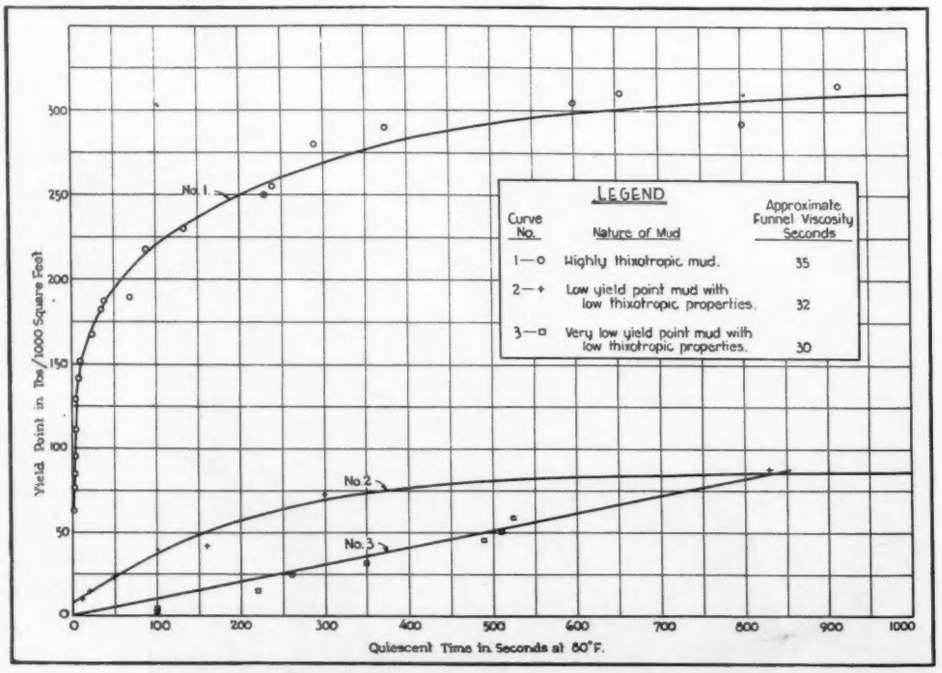
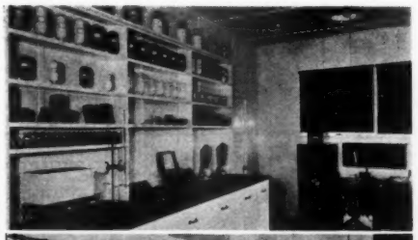
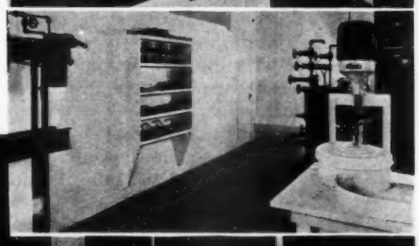
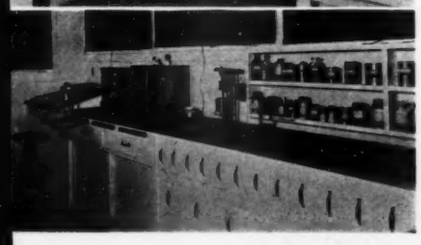


Fig. 6—Results of torsion shearometer tests on various muds

PIONEERS







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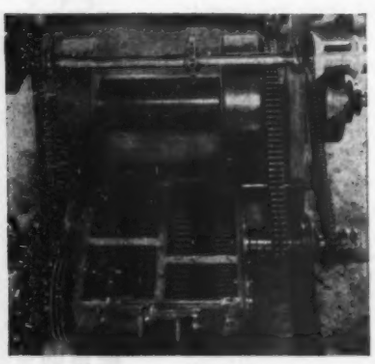

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ly and which is relatively close to drilling wells in nearby fields, it has been found advisable to set up a small central field laboratory for testing mud. The equipment includes a mud weight balance, funnel viscosimeter, torsion shearometer, an assembly for making four elutriation sand determinations simultaneously, and a battery of four static performance testers.

This field also is provided with a central mud reclaiming plant, which consists essentially of a number of tanks and sumps for storing muds and a Merco mud desanding centrifuge. Each drilling well is connected with the central mud plant by two lines, one of which is used to deliver clean, properly conditioned mud to the well, and the other to carry the used mud back to the central mud plant.

The general supervision of operations having to do with mud quality in the district served by the field laboratory is delegated to a petroleum engineer who has had considerable experience both in rotary drilling and in mud research. His duties are to check the quality of mud delivered by venders, make tests to insure the maintenance of satisfactory mud quality at each well, supervise any

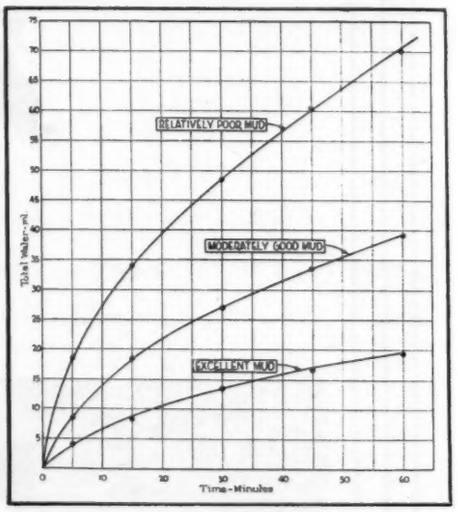

Fig. 7—Results of static performance tests on various muds

treatments or unusual movements of mud that are made at the wells or central mud plant, and cooperate with the drilling superintendents in establishing the mud quality required for the various drilling wells.

The spirit of cooperation between members of the technical staff assigned to mud operations and representatives of the drilling department has been all that could be desired, and its importance in the successful operation of mud control activities cannot be overemphasized.

It is, of course, impossible to say definitely that fewer drilling difficulties have occurred under this system than would have been experienced without it. However, the men in charge of drilling operations are of the general opinion that drilling conditions have been improved, and it is certain that large savings in mud have been obtained.

The author wishes to acknowledge the assistance of J. T. Ledbetter and W. M. Newton of Union Oil Co. who made most of the laboratory tests reported. Mr. Ledbetter also contributed materially to the development of the torsion shearometer and the static performance tester.

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Applying Phase-Equilibrium Data to Estimation of Oil and Gas Reserves

By B. H. SAGE and W. N. LACEY
California Institute of Technology, Pasadena, Calif.

Many natural petroleum reservoirs are of such complex stratigraphic configuration that it appears to be impractical to ascertain their contents by detailed estimates and studies. Under these conditions a more general macroscopic approach will often yield results which are of value in the estimation of oil and gas reserves and in the determination of the effects of differing production techniques upon the reservoir conditions. This paper deals with the application of certain laboratory and field measurements to the estimation of oil and gas reserves in accordance with this method.

The macroscopic approach to this problem is not new. Coleman, Wilde, and Moore[1] developed a method of reserve estimation based upon the use of a material balance of the hydrocarbon materials throughout the period of production, and the assumptions that these materials follow the perfect gas law and an idealized solution behavior. Schilthuis[2] and Katz[3] have also made calculations of this nature for several Mid Continent fields—basing, however, their calculations upon laboratory measurements of hydrocarbon behavior. Recently, Huntington[4] discussed several hypothetical cases, and indicated the significant effects of edge-water encroachment and the presence of gas-cap areas upon these calculations. In general, these latter methods require a knowledge of the composition of the materials in the reservoir as indicated by subsurface samples taken in the early stages of development of the field. Although this information is obtainable under some conditions, satisfactory sub-surface samples are very difficult to obtain from wells producing from numerous gas and oil bodies such as are encountered in many of the multi-zoned fields.

The actual phase behavior of the fluids, i.e., water and hydrocarbons, within a natural reservoir is an exceedingly complex physical phenomenon. At the present time information concerning the stratigraphic location of these materials within actual reservoirs is uncertain, and laboratory investigation of the effect of pressure, temperature, and composition upon the equilibrium-phase behavior of reservoir fluids has not progressed as far as is necessary for many purposes. For these reasons it is impossible to investigate reservoir conditions by macroscopic methods without making a number of simplifying assumptions concerning the behavior of these fluids. Due to the need of even rough methods of evaluating oil and gas reserves, and of determining the effects of various production methods upon reservoir conditions, some attempt in this direction seems worthwhile. This paper does not purpose to present a satisfactory treatment of these important reservoir problems. It has been prepared to show the type of information which can be ascertained concerning reservoir conditions based upon present field and laboratory information, and what assumptions are necessary to permit an approximate solution of a few of the simpler problems. Following this point of view, the reservoir has been considered from an idealized viewpoint, and several assumptions have been made which are known not to be strictly true. Until such a time as these assumptions and simplifications can be justified, the results obtained cannot be of great precision. It is believed, however, that the values of oil and gas reserves estimated by these methods are of use in determining the relative future production from different fields.

***A.P.I.*—Presented before the mid-year meeting, June 1 to 3, Colorado Springs, Colorado**

General Method

The reservoir is here considered to be a system of variable volume from which hydrocarbons are removed only in two ways. One of these is by production of oil and gas from the wells tapping the reservoir. The other is by the loss of oil from the effective reserve as a result of its occlusion or isolation by the advancing edge water. The advancing edge water constitutes the medium by which the volume of the reservoir is altered during the period of production. By considering the reservoir from this point of view, it is possible to express certain quantities such as gas-oil ratio and formation volume in terms of the oil and gas reserves and certain volumetric data relating to the reservoir. The relation of formation volume and gas-oil ratio can also be determined from laboratory measurements upon hydrocarbon fluids. By combining these two sources of information concerning gas-oil ratio and formation volume, it is possible to evaluate the oil and gas reserves in terms of the production of oil and gas, volumetric changes of the reservoir, and certain quantities derived from laboratory measurements pertaining to the reservoir fluids in question. In the following sections the evaluation of these various quantities is discussed in some detail, and calculations are made for several hypothetical cases.

This approach to the estimation of underground reserves involves several assumptions as to the behavior of the hydrocarbon material within the reservoir. At the present state of experimental knowledge it is impossible to verify some of them; but, as more information accumulates, the specific applicability of all of these assumptions can be tested. As a first approximation, it is desirable to assume that the hydrocarbon materials are at thermodynamic equilibrium at all times within the reservoir. This assumption is never realized in a producing formation, since there must necessarily be pressure gradients in the direction of flow which will cause variation from equilibrium behavior. However, within each portion of the field the properties of the hydrocarbon fluids are probably not greatly different from those predicted for equilibrium conditions on the basis of the prevailing pressure and temperature. Due to the large heat capacity of the formation, it seems reasonable to assume that all changes which take place within the reservoir as a whole may be considered as isothermal. This latter assumption has often been justified by sub-surface measurements taken over extended periods. The assumption of isothermal conditions does not always apply to small portions of the reservoir in which considerable movement of reservoir fluids takes place.

For present purposes it has been assumed that there is a negligible effect of water upon the thermodynamic behavior of the hydrocarbon material. It is realized that this assumption is not strictly true, and that it may introduce appreciable errors, especially in fields operating at high temperatures and pressures in which the water is widely dispersed through the oil-bearing formation.

At present there is insufficient experimental information to permit accurate prediction of the pressure-volume-temperature relations of a given hydrocarbon mixture from a knowledge of its true composition. For this reason, a simplified index of composition such as gas-oil ratio must be employed. This procedure assumes that any of the hydrocarbon material produced from or present in a given formation can be described completely in terms of varying amounts of an arbitrarily-chosen oil and gas of fixed compositions. This condition is not strictly true at any time, and may introduce appreciable errors when the same oil and gas are used to describe the composition of the production throughout an extended period. For some purposes it will be assumed that there is a linear relation between formation volume and gas-oil ratio at a given constant temperature and pressure.

Field Data

A knowledge of the oil and gas production from the reservoir is the primary source of field information employed, since all of the subsequent calculations utilize this information. Values of average reservoir pressure must also be available at several times during the production history of the field. A knowledge of the reservoir temperature is necessary in order to permit the application of the laboratory measurements. Information upon the encroachment of edge water, as well as data upon the sand count, porosity, connate-water content, and oil occlusion,[1] are desirable and, in some cases, will permit a check upon the assumed behavior of the hydrocarbon materials within the reservoir. In the use of these field data, it is necessary to make a few additional assumptions as to just how this information is to be interpreted. For example, the average pressure within the

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reservoir may be determined in a variety of ways. For present purposes it appears to be desirable to determine a weighted average based upon the volumetric or areal extent of the field. The sand count, porosity, and connate-water content should likewise be weighted averages for the field. It is beyond the scope of this paper to discuss the methods of determining the individual values and the various pertinent methods of weighting them which should be employed in specific instances.

Definition of Terms

Before entering into a discussion of the derivations of the various equations employed herein, a brief description of the terms employed is desirable.

Standard surface conditions: A temperature of 60 deg. F. and an absolute pressure of 14.73 lb. per sq. in. are chosen as standard surface conditions.

Oil reserve (R_L): The oil reserve of a reservoir is considered to be that portion of the reservoir fluid which would be measured as oil under standard surface conditions. Throughout this paper this quantity will be expressed in barrels.

Gas reserve (R_G): The gas reserve of a reservoir is considered to be that portion of the reservoir fluid which would be separated and measured as gas under standard surface conditions, in cubic feet.

Oil production (L): The oil production is considered to be the cumulative amount of oil, expressed in barrels measured at standard surface conditions, which has been produced from the reservoir since some arbitrarily-chosen time, which may or may not be the time of discovery of the reservoir. The particular period of time involved is indicated by subscripts.

Gas production (G): The gas production is the cumulative amount of gaseous hydrocarbons which has been produced from the reservoir since some arbitrarily-chosen time. This gas production will be expressed as cubic feet of gas as separated and measured at standard surface conditions.

Space volume (V_s): The space volume of a reservoir is defined here as the net voids of the reservoir containing hydrocarbon material and within the edge-water boundary. In general, the space volume in barrels may be calculated from a knowledge of the total volume of the reservoir in barrels (V_T), the fraction (s) of the total volume of the reservoir which consists of porous sands containing hydrocarbons, the average porosity of the sand (p), the volume fraction (c) of the pore space which is occupied by connate water. The quantities s, p, and c are expressed as fractions:

$$V_s = V_T SP(1 - C) \qquad (1)$$

In order to evaluate the total volume of the reservoir, a knowledge of the position of edge water, as well as of the stratigraphic boundaries of the reservoir, is necessary.

Formation volume (V_F): The reservoir formation volume is defined as the number of units of space volume of the formation which contain a unit volume of oil as measured under standard surface conditions. The reservoir formation volume is related to the oil reserve and the space volume of the reservoir by the following equation:

$$V_F = \frac{V_s}{R_L} \qquad (2)$$

Occlusion factor (r): During the encroachment of edge water a certain quantity of oil is lost from the effective oil reserve of the reservoir, being surrounded or occluded by the advancing water body. For present purposes it is assumed that this loss of oil is directly proportional to the encroachment of the edge water. The quantity r is expressed as a fraction of the decrease in space volume resulting from the encroachment by edge water. Under these conditions the quantity of oil thus lost would be represented by:

$$\text{Oil lost between the times } t_1 \text{ and } t_2 = r(V_{s_1} - V_{s_2}) \qquad (3)$$

Reservoir pressure (P): Throughout this paper the reservoir pressure is considered to be a weighted-average pressure for the producing formation as a whole, expressed in pounds per square inch, absolute.

Reservoir temperature (T): The average reservoir temperature may be determined in a manner analogous to that used for the reservoir pressure, and is expressed in degrees Fahrenheit.

Gas-oil ratio (C): The reservoir gas-oil ratio, which is the only one involved in these calculations, is expressed in cubic feet of gas per barrel of oil, both the oil and gas being measured under surface standard conditions.

Constants ($a, b, \ldots\ldots$): Throughout the following discussion it will be necessary to employ constants for various purposes. In each case the numerical value of these quantities can be determined from the conditions stipulated for the equation as a whole. They are in no way related to the parameters of the equation, and are entirely independent of the specific value of the dependent and independent variables.

Subscripts ($1, 2, 3, \ldots\ldots$): Various times during the development of the field will be designated by numerical subscripts. For example, V_{s_1} and V_{s_2} represent the space volumes of the reservoir at two different times, 1 and 2; while ${}_1L_2$ represents the oil production during the interval between times 1 and 2.

Reservoir Formation Volume

It is apparent that the oil reserves of a reservoir at any time, such as t_1, in the past are related to the oil reserves at some subsequent time, t_2, by the following expression:

$$R_{L_1} = R_{L_2} + {}_1L_2 + r(V_{s_1} - V_{s_2}) \qquad (4)$$

This expression states that the oil reserves at t_1

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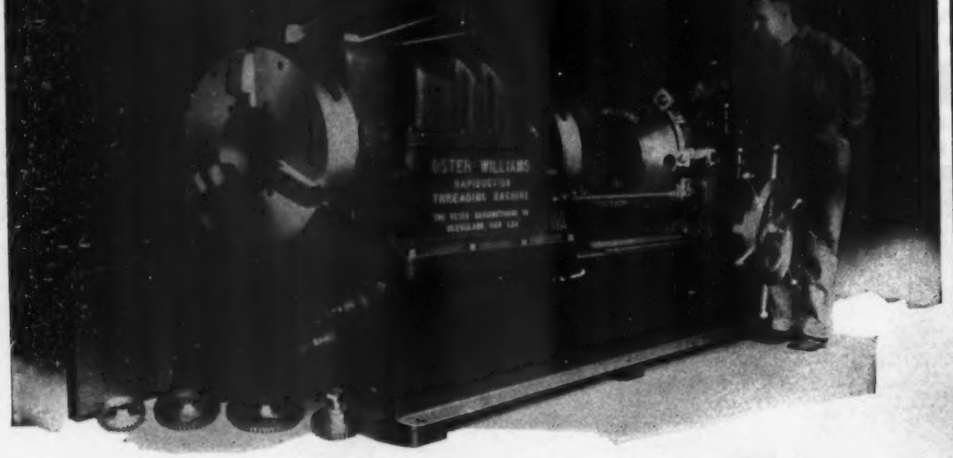

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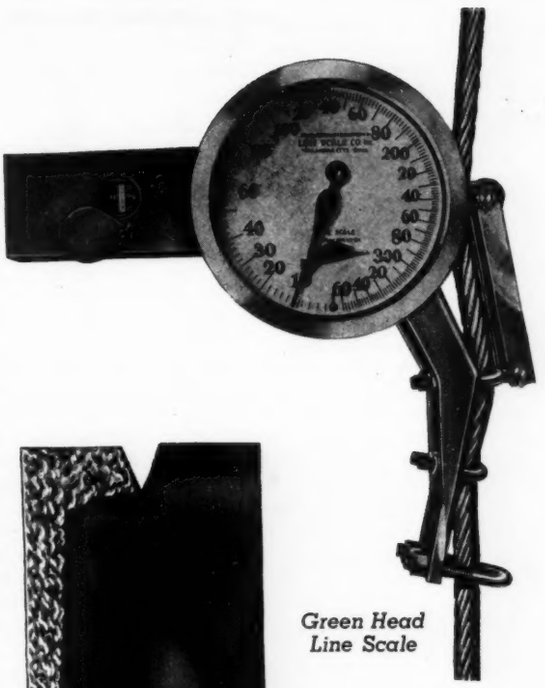

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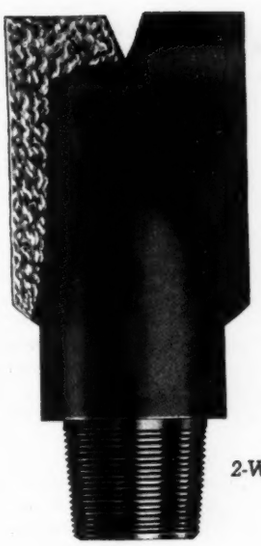

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TABLE 1—ASSUMED FIELD DATA

		Units	Time t^1	Time t^2	Time t^3
Oil produced after t^1	...	Bbl.	0	18×10^6	30×10^6
Gas produced after t^1	...	Cu. ft.	0	53×10^9	75×10^9
Oil production	tL^2	Bbl.	30×10^6	12×10^6	0
Gas production	tG^2	Cu. ft.	75×10^9	22×10^9	0
Space volume	V_s	Bbl.	130×10^6	72×10^6	35×10^6
Reservoir pressure	P_R	Lb. per sq. in., absolute	2,500	1,500	600
Reservoir temperature	T	Deg. F.	160	160	160
Laboratory Data					
Constants	a		1.14×10^{-3}	1.91×10^{-3}	4.93×10^{-3}
	b		0.647	0.641	0.594
Calculated Reserves					
Gas reserves	R_G	Cu. ft.	81.17×10^9	28.17×10^9	6.17×10^9
Oil reserves	R_L	Bbl.	57.9×10^6	27.6×10^6	7.7×10^4
Occlusion factor	r		0.21	0.21	0.21

are equal to the oil reserves at t_3, plus the intervening oil production, plus the oil loss resulting from its occlusion by the encroaching edge water. In a similar manner, the oil reserves at some intermediate time, t_2, may be expressed by:

$$R_{L_2} = R_{L_3} + {}_2L_3 + r(V_{s_2} - V_{s_3}) \quad (5)$$

From equation (2) it is seen that the formation volume at each of the above times may be expressed by the following equations:

$$V_{F_1} = \frac{V_{s_1}}{R_{L_1}} = \frac{V_{s_1}}{R_{L_3} + {}_1L_3 + r(V_{s_1} - V_{s_3})} \quad (6)$$

$$V_{F_2} = \frac{V_{s_2}}{R_{L_2}} = \frac{V_{s_2}}{R_{L_3} + {}_2L_3 + r(V_{s_2} - V_{s_3})} \quad (7)$$

$$V_{F_3} = \frac{V_{s_3}}{R_{L_3}} \quad (8)$$

These last expressions involve no assumptions as to the attainment of equilibrium or as to the ability to represent the composition of the reservoir fluid by means of gas-oil ratios.

Reservoir Gas-Oil Ratio

The gas-oil ratio of the contents of a reservoir may be expressed in terms of the current gas and oil reserves as follows:

$$C = \frac{R_G}{R_L} \quad (9)$$

It is apparent that the gas reserve of a reservoir at any time t_1 is related to the gas reserve at some subsequent time t_2 by the following relation:*

$$R_{G_1} = R_{G_2} + {}_1G_2 \quad (10)$$

Employing this expression for the gas reserves at t_1, t_2, ... and the corresponding values for the oil reserves as indicated by equations (4) and (5), the following expressions for the gas-oil ratio may be written:

$$C_1 = \frac{R_{G_2} + {}_1G_2}{R_{L_2} + {}_1L_2 + r(V_{s_1} - V_{s_2})} \quad (11)$$

$$C_2 = \frac{R_{G_2} + {}_2G_3}{R_{L_2} + {}_2L_2 + r(V_{s_2} - V_{s_3})} \quad (12)$$

$$C_3 = \frac{R_{G_3}}{R_{L_3}} \quad (13)$$

The Relation of Formation Volume to Gas-Oil Ratio

The formation volume, just as the specific volume, is solely a function of the equilibrium pressure and temperature and of the composition of the mixture as a whole. It is, therefore, possible to determine the formation volume of the mixture if these variables are known, along with the necessary experimental information. Since all of the changes in reservoir conditions are assumed to be substantially isothermal, the problem resolves itself into the evaluation of formation volume as a function of pressure and gas-oil ratio.

Experimental work[5, 6, 7] has indicated that there is a nearly linear change in formation volume with gas-oil ratio under isothermal-isobaric conditions when both gas and liquid phases are present. At a given temperature and pressure, the formation volume may then be expressed in terms of the gas-oil ratio by an equation of the following form:

$$V_F = aC + b \quad (14)$$

In this expression both a and b* are independent of the gas-oil ratio, but are functions of the prevailing pressure, temperature, and compositions of the gas and the oil. Since this equation has no physical significance except in the two-phase region, care must be exercised before using it to be sure that the conditions of temperature, pressure, and gas-oil ratio are such that the system exists as two phases.

For present purposes the constant a may be evaluated as a function of pressure from the slopes of the isobars representing the variation in formation volume with gas-oil ratio. This quantity, which has been assumed a constant for a given pressure, is markedly affected by changes in pressure and, to a lesser extent, by temperature changes. The constant b, which is the intercept of each of the above-mentioned isobars with the formation volume axis, must be determined with as good precision as possible, since the values of the oil reserves are directly dependent upon it. In general, this intercept should be determined from experimental data in the vicinity of bubble point, taken with the slope, a, of the isobar as determined for the higher gas-oil ratios. It must be remembered that any deviation of the actual behavior from this assumed linear variation in formation volume with gas-oil ratio will introduce a corresponding error in the estimated reserves. The same general methods could be used if a more complicated relation between gas-oil ratio (i.e., composition) and formation volume were employed. In fact, a graphical solution involving a series of approximations could be obtained if no suitable analytical relation between gas-oil ratio and formation volume were available.

As will be apparent from the following derivation, errors in the value of b have only a minor effect upon the estimated values of the gas reserves, but the values of the oil reserves are directly related to this constant. On the other hand, the gas reserves are related to the constant a in such a way that errors in this constant cause corresponding errors in their value.

Equation (14) may be re-written for the three times, t_1, t_2, t_3, as follows:

$$V_{F_1} = a_1C_1 + b_1 \quad (15)$$

$$V_{F_2} = a_2C_2 + b_2 \quad (16)$$

$$V_{F_3} = a_3C_3 + b_3 \quad (17)$$

Oil and Gas Reserves

The values for the reservoir gas-oil ratio as given by equations (11), (12), and (13) may be substituted in equations (15), (16), and 17), respectively; and the values of formation volume given by these equations in turn substituted in equations (6), (7), and (8), respectively. After making these substitutions and simplifying, there are obtained the following equations:

$$a_1(R_{G_3} + {}_1G_3) + b_1[R_{L_3} + {}_1L_3 + r(V_{s_1} - V_{s_3})] = V_{s_1} \quad (18)$$

$$a_2(R_{G_3} + {}_2G_3) + b_2[R_{L_3} + {}_2L_3 + r(V_{s_2} - V_{s_3})] = V_{s_2} \quad (19)$$

$$a_3R_{G_3} + b_3R_{L_3} = V_{s_3} \quad (20)$$

If the pressure, temperature, and space volume of the reservoir are known at each of the three times, all of the quantities in these three equations are immediately determined with the exception of the oil and gas reserves at t_3 and the occlusion factor r. The values of a and b are ascertained from a knowledge of the prevailing reservoir pressure and temperature and information as to the volumetric behavior of the particular reservoir oil and gas. The values of oil and gas production between the specified intervals of time are readily determinable from field-production data. Under these conditions there are three independent equations and the three unknowns mentioned above. Due to the number of terms involved, the detailed solution of these three simultaneous equations is lengthy, and has been omitted. The gas reserve of the reservoir as determined by means of equations (18), (19), and (20) is:

$$R_{G_3} = \frac{b_1b_2(V_{s_1} - V_{s_3})(V_{s_2} - a_2\,{}_2G_3 - b_2\,{}_2L_3) - b_2b_3(V_{s_2} - V_{s_3})(V_{s_1} - a_1\,{}_1G_3 - b_1\,{}_1L_3)}{a_2b_1b_3(V_{s_1} - V_{s_3}) - a_1b_2b_3(V_{s_2} - V_{s_3}) - a_3b_1b_2(V_{s_1} - V_{s_2})} - \frac{b_1b_2(V_{s_1} - V_{s_2})V_{s_3}}{a_2b_1b_3(V_{s_1} - V_{s_3}) - a_1b_2b_3(V_{s_2} - V_{s_3}) - a_3b_1b_2(V_{s_1} - V_{s_2})} \quad (21)$$

In a similar manner, the oil reserve of the reservoir may be determined by substitution in the following equation:

$$R_{L_3} = \frac{V_{s_3} - a_3R_{G_3}}{b_3} \quad (22)$$

In case it is desired to evaluate the occlusion factor, r, on the basis of these equations, it may be calculated from the following expression:

$$r = \frac{V_{s_1} - a_1(R_{G_3} + {}_1G_3) - b_1(R_{L_3} - {}_1L_3)}{b_1(V_{s_1} - V_{s_3})} \quad (23)$$

It is seen that these last three equations are somewhat cumbersome and lengthy of solution. For this reason, it is usually preferable to substitute all of the numerical data in equations (18), (19), and (20) and simplify, as far as possible, before attempting to eliminate any of the unknowns between these simultaneous equations.

In Table 1 the first part lists some assumed field information for a hypothetical reservoir of variable volume. If this information is substituted

*This statement neglects the quantity of gas, both free and dissolved, which is occluded by the encroaching edge water. The amount of *dissolved* gas lost on the basis of the previously-stated assumption is:

$$\text{Dissolved gas lost} = \int_{V_{s_3}}^{V_{s_2}} K r dV_s$$

K is the solubility of the gas, in cubic feet dissolved in 1 bbl. of oil (both measured at surface standard conditions) at the temperature and pressure in question. Since K is a variable and is a function of other variables than V_s, this integration cannot be carried out without specific information as to the relation between K and V_s for the reservoir during the period involved. This is indicated in the equation by using a line integral sign.

*The constants a and b in equation (14) are the isobaric-isothermal partial volumes for the gas and oil, respectively, expressed in different units from those normally employed. [G. N. Lewis and M. Randall, *Thermodynamics and the Free Energy of Chemical Substances*, McGraw-Hill Book Co., New York, 42 (1923)]. In this case it has been assumed that each of these partial quantities is constant throughout the entire two-phase region for a given temperature and pressure. This is a rather far-reaching assumption concerning the behavior of hydrocarbon mixtures, and is never strictly adhered to. Significant deviations from this behavior are encountered in the vicinity of bubble point and throughout the two-phase region in the vicinity of the critical state of the mixture in question. Experimental evidence indicates that b, the partial volume of the liquid, does not vary greatly with either temperature or pressure in many hydrocarbon systems as long as these regions are not involved.

in equations (18), (19), and (20), along with values (second part of Table 1) of the constants a and b as determined from experimental measurements[6] upon oil and gas from the Dominguez field in California, the following simple expressions result:

$$1.14\times10^{-3}R_{G_2}+0.647R_{L_2}+61.46\times10^{6}r = 25.09\times10^{6} \quad (24)$$

$$1.91\times10^{-3}R_{G_3}+0.641R_{L_3}+23.72\times10^{6}r = 22.29\times10^{6} \quad (25)$$

$$4.93\times10^{-3}R_{G_4}+0.594R_{L_4} = 35\times10^{6} \quad (26)$$

The simultaneous solution of these three equations gives a value of 7.7×10^{6} bbl. for the estimated oil reserve, and 6.17×10^{9} cu. ft. for the gas reserve at t_3. It is also found that r is equal to 0.21, which would indicate that there had been a loss of 20×10^{6} bbl. of oil as a result of its occlusion in the encroaching edge water between t_1 and t_2. It must be remembered that throughout this solution the quantity of gas, both free and dissolved, that was lost in the encroaching edge water has been neglected. It would be possible to include these terms in the original expressions for gas-oil ratio, and thereby take them into account in the final expression. This was not considered worthwhile at the present state of our knowledge concerning the attainment or non-attainment of equilibrium within and between the various parts of the reservoir.

In many instances satisfactory data are not available concerning the pressure, temperature, and space volume of the reservoir at three different times. Under these circumstances, it is possible to evaluate the oil and gas reserves if information, experimentally determined or assumed, concerning the value of the occlusion factor r is available. Sometimes such information is available from cores of wells drilled into water-flooded areas. If r is known, equations (19) and (20) may be solved simultaneously to give the following expressions for the gas and oil reserves in terms of the constants a and b, the occlusion factor r, and pertinent field data:

$$R_{G_2} = \frac{b_2(V_{S_1} - b_{1\ 1}L_2 - b_1(V_{S_1} - V_{S_2})\ r - a_{1\ 1}G_2) - b_1V_{S_2}}{a_1b_2 - a_2b_1} \quad (27)$$

$$R_{L_2} = \frac{V_{S_2}(a_1b_2 - a_2b_1) - a_2b_2[V_{S_1} - b_{1\ 1}L_2 - b_1(V_{S_1} - V_{S_2})\ r - a_{1\ 1}G_2] - a_2b_1V_{S_2}}{b_2(a_1b_2 - a_2b_1)} \quad (28)$$

In Table 2 is presented another series of data upon a hypothetical field which is more nearly depleted. In this case it was assumed that no early information was available upon the field, with the exception of an estimated initial pressure and a space volume deduced from water levels in newly-completed wells. The data recorded in the last column were assumed to be obtained from measurements made at the time t_3. It was also assumed that an average value of 0.10 for r corresponded to the oil lost by occlusion throughout the period of production, as determined from cores taken in that part of the reservoir already encroached by edge water. Substitution of these data in equations (27) and (28) gives values of 4.7×10^{6} bbl. and 9.21×10^{9} cu. ft. for the oil and gas reserves, respectively, for t_3.

It is of interest to investigate how large an error is involved due to possible inaccuracies in the determination of the proper value of r. It is apparent in this case that the field is fairly well depleted, and that a large portion of the original space volume has been filled with water. The value of r assumed above indicates that there has been 32.5×10^{6} bbl. of oil lost in this manner. A few per cent error in this oil loss would cause a numerically equal error in the estimation of the

TABLE 2—ASSUMED FIELD DATA

		Units	Time t_1	Time t_3
Oil production after t_1	...	Bbl.	0	130×10^{6}
Gas production after t_3	...	Cu. ft.	0	205×10^{9}
Oil production	$_1L_2$	Bbl.	130×10^{6}	0
Gas production	$_tG_2$	Cu. ft.	205×10^{9}	0
Space volume	V_S	Bbl.	400×10^{6}	75×10^{6}
Reservoir pressure	P_R	Lb. per sq. in., absolute	2,200	400
Reservoir temperature	T	Deg. F.	180	180
Occlusion factor	r		0.10	0.10
Laboratory Data				
Constants	a		1.36×10^{-3}	7.84×10^{-3}
	b		0.650	0.580
Calculated Reserves				
Gas reserves	R_G	Cu. ft.	214.2×10^{9}	9.2×10^{9}
Oil reserves	R_L	Bbl.	167.2×10^{6}	4.7×10^{6}

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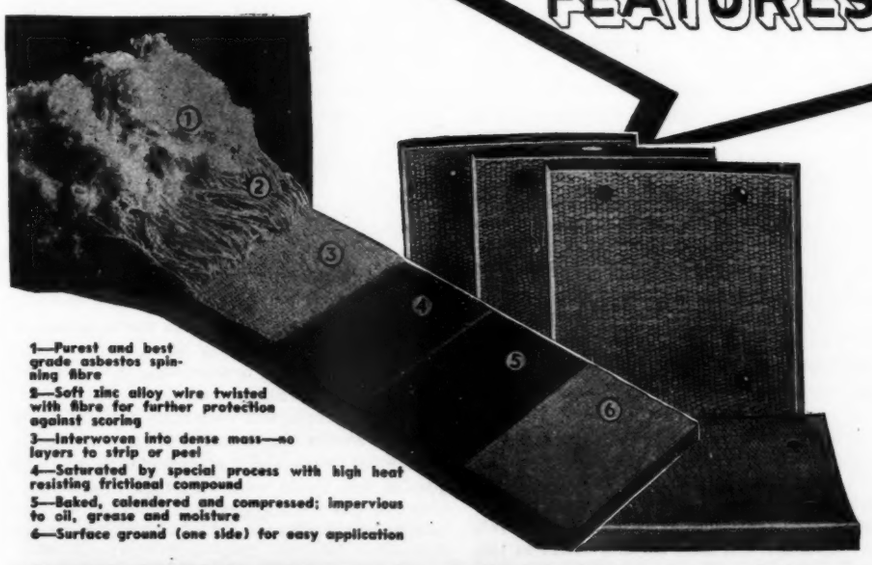

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oil reserve. When the reserve is less than the oil loss, the error becomes increasingly important on a percentage basis.

With as large a change in pressure as was assumed in the example, an appreciable error was probably introduced due to the assumption that the oil and gas reserves at t_2 could be described in terms of the same oil and gas that were employed to describe the composition of the reservoir in the early stages of production. At the later time, the gas was probably richer in the heavier components and, hence, more soluble than was the gas which existed in equilibrium with the oil initially.

From a consideration of equations (6), (7), (8) and of equations (11), (12), and (13), it is seen that no assumption as to the composition of the oil and gas is involved in these expressions. It is, therefore, possible to evaluate the constants a and b in equations (15), (16), and (17) for each separate time by means of appropriate experimental information for material which approximates more closely that existing within the formation at each of the times in question. In some instances where the linear relation between formation volume and gas-oil ratio under isobaric-isothermal conditions breaks down, it would be necessary to substitute more complicated analytical relations in place of the linear ones employed in equations (15), (16), and (17). If it was found that this unduly complicated the solution, the values of the oil and gas reserves could be ascertained by a series of approximations employing as a basis equations (6), (7), and (8) and equations (11), (12), and (13), along with the experimental information upon the variation in formation volume with gas-oil ratio.

In the previous paragraphs the problem of evaluating oil and gas reserves of reservoirs in which the hydrocarbons exist in two phases has been considered from a general point of view. In some instances it is possible to determine the oil and gas reserves of such reservoirs without a knowledge of all of the information required in these general solutions. Under circumstances when values of s, p, and c are not available, the oil and gas reserves could be evaluated by the simultaneous solution of four equations similar to equations (18), (19), and (20) for four different times. In this case the total volume of the reservoir and a term representing the product of the sand count of the formations, the average porosity, and the connate-water content would be substituted for the space volume in accordance with equation (1).

Attainment of Equilibrium

In the present state of our knowledge, there is some uncertainty as to how closely equilibrium is followed within a reservoir during the period of production. It is probably never maintained in any reservoir; and significant departures from this state are known to exist in almost all fields in which the producing sand is of low permeability, since this condition requires large pressure gradients to cause practical rates of flow.

It may be possible to learn something of the degree of approach to equilibrium within certain reservoirs whose configuration is not unduly complicated by rapid and irregular encroachment of edge water, faulting, or other factors. Under these favorable conditions for obtaining accurate field data, the agreement or disagreement of oil and gas reserves at one given time calculated from production data covering different periods of the producing life of the field could be used as an index of the degree of attainment of equilibrium within the reservoir during these production intervals.

As Schilthuis[2] has indicated, errors from nonattainment of equilibrium tend to give low values for the oil and gas reserves of a field where there is a decline in pressure with production. On the other hand, fields for which there is a period of rise in pressure under curtailed production, due to the water drive, tend to show too large values for the reserves upon application of these methods for that period.

Special Cases

In reservoirs in which there is no encroachment of edge water, the problem is greatly simplified, and the expressions for the oil and gas reserves become:

$$R_{G_2} = \frac{V_B(b_2 - b_1) - b_1 b_2 {}_1L_2 - a_1 b_2 {}_1G_2}{a_1 b_2 - a_2 b_1} \quad (29)$$

$$R_{L_2} = \frac{V_B - a_2 R_{G_2}}{b_2} \quad (30)$$

Information regarding the reservoir pressure, temperature, and the oil and gas production at the times, t_1 and t_2, would permit the determination of the reserves without a knowledge of the space volume of the reservoir.

In some instances it is possible to determine the composition of the reservoir fluid by suitable sampling and analysis, and in these cases the reserves may be calculated without information upon the space volume of the reservoir as a function of time, even though edge water is known to move. No detailed discussion of these methods will be given, since they have already been treated by Coleman, Wilde, and Moore.[3] Likewise, the estimation of reserves in gas fields is not considered, since these calculations have already been described.[4]

Discussion of Method

Although it is believed that the equations presented properly represent the equilibrium relations of gas and oil reserves to the gas and oil production, to the space volume, and to the pressure of the reservoir, there are several inherent disadvantages in these methods. A discussion of the errors and uncertainties which are involved will permit a better evaluation of the applicability of this approach to specific instances.

One of the most uncertain of the field measurements involves the determination of the total change in the volume of the reservoir resulting from the encroachment of edge water. In many instances it is necessary to rely upon the water production of the wells to ascertain the approximate position of edge water in a reservoir. If sufficient information obtained from electric coring is available, it is usually possible to determine the stratigraphic boundaries of the formation as well as the position of edge water with satisfactory precision for these purposes. For these reasons it is believed that values for the change in the space volume of a reservoir at several times in its production history can usually be determined with the methods that are now available to production technologists. It is realized that such information is not available for the early life of the older fields, since satisfactory well-survey instruments have been developed only in recent years. None of the other field measurements appears to offer undue difficulty, with the exception of the proper evaluation of an average reservoir pressure in instances where production has taken place unevenly in certain parts of a field.

If the necessary field data are available, it is believed that the values of gas reserves as determined by equation (21), or its equivalent, are satisfactory—unless large deviations from equilibrium are encountered. From a review of equations (18) and (20), it is apparent that the accuracy of the estimated gas reserve is directly proportional to the accuracy of the gas-production figures, while the oil production has only a small effect in this connection. The quantity of gas lost by its occlusion in either the free or dissolved state by the encroaching edge water does not appear to be a serious source of error in the calculation of gas reserves.

Unfortunately, the oil reserves cannot be calculated with a precision comparable to that for the gas reserves. From a consideration of equation (22), or its equivalent, it is observed that the value of the oil reserve calculated in this manner involves small differences in the two large quantities, viz., the space volume and the product of the gas reserve and the constant a. The value of the oil reserve is also directly dependent upon the numerically small value of the constant b. Although this intercept may be determined with satisfactory accuracy if it is assumed that there is a linear variation in formation volume with gas-oil ratio, even minor deviations from such behavior bring in appreciable uncertainties in the exact value. Small uncertainties in a small quantity may mean large percentage errors in the quantity, which are in turn directly reflected in a result obtained by using the quantity as a factor, as b is in equation (22). From a consideration of this approach, it is also apparent from equation (22) that small errors in the gas-production data, which cause comparable errors in the values of gas reserve, will result in disproportionately large errors in the calculated oil reserve, since the numerator involves the small difference in two large quantities. For example, an error of 10 per cent in the gas-production data assumed in the illustration reported in Table 1 would cause over 100 per cent error in the calculated oil reserve. The same situation is found in evaluating r by means of equation (23) or its equivalent, since in this case even smaller differences in large numbers are encountered.

It is believed that this sensitivity of the calculated oil reserve to the gas-production data is inherent in any method of attempting to evaluate oil reserves in terms of oil and gas production and of the reservoir conditions at several times, unless definite information is available concerning the composition of hydrocarbon contents of the reservoir. This sensitivity is due to the properties of the hydrocarbon mixtures involved, and is not a result of the specific approach employed. A simplified example will perhaps illustrate the significance of this behavior better than any other way. A container of constant volume maintained at constant temperature and filled with a two-phase oil-gas mixture is considered as the idealized reservoir. The addition of 1 cu. ft. of gas, as measured under reservoir conditions, would cause a certain increase in pressure. On the other hand, the addition of 1 cu. ft. of oil, as measured under reservoir conditions, would not greatly change the equilibrium pressure within the container so long as two phases still were present. In fact, such an addition might, under some circumstances, cause a decrease of the equilibrium pressure. Corresponding results are obtained when either material is withdrawn from an actual reservoir. In other words, it would only make a slight difference in the resulting equilibrium pressure of a reservoir whether oil containing 1,000 cu. ft. of dissolved gas were removed from the reservoir or whether the 1,000 cu. ft. of gas were removed from the gas phase of the reservoir and no oil were produced.*

This inherent limitation in the accurate evaluation of oil reserves may be overcome if direct means are employed to determine the composition of the reservoir fluid as a whole. This could be done, for example, if it were known that the hydrocarbons within a reservoir existed initially solely as a liquid phase, and if representative depth samples of this liquid were subjected to analysis. In this case the original gas reserves could be readily ascertained by means of equation (21) and the

*As was previously mentioned, the constants a and b are the partial specific volumes of the gas and oil, respectively. The partial volume of 1 lb. of gas is many times the partial volume of 1 lb. of the oil at lower pressures. Since these quantities occur as additive terms in all of the above expressions, a small error in gas production will cause a disproportionately large error in the value of the oil reserve and, conversely, a large error in the oil production will not greatly affect the estimation of the gas reserve.

initial oil reserves then evaluated from the knowledge of the gas-oil ratio of the original fluid as calculated from its analysis.

Differential Methods

The methods of calculating reserves that have been described in this paper are by no means the only approach that can be employed. The general equation of partial differentiation may be considered as an exact statement of the conservation principle which formed the basis of the present application and, as such, can be successfully applied to estimation of oil and gas reserves. This differential approach, although fundamentally the same, avoids the necessity of considering the reservoir fluids as made up of varying amounts of two complex constituents which are involved in the present method. In order to apply such methods, however, it is necessary to know the quantities of each of the lighter components (i.e., methane through the pentanes) that have been produced from the reservoir, as well as the quantity of heavier material. This information is needed in addition to the reservoir temperature, pressure, and volume information which were also used in the other approach. This differential method also requires laboratory information upon the partial volume (or its equivalent) for each of the components considered, as a function of the pressure, temperature, and composition of the system.

Summary

The present paper was prepared more as a review of what can be done with present laboratory and field information in the investigation of the conditions which exist in actual reservoirs than as a presentation of any new approach to this rather difficult but important problem. It is the authors' belief that macroscopic methods such as the ones described in the present paper afford a reasonably satisfactory method of estimating the gas reserves of many natural reservoirs in which there is not too great a variation in pressure from one part of the field to another. Due to the inherent behavior of hydrocarbon systems, it appears impossible to estimate the oil reserves with a corresponding accuracy. This latter difficulty can be overcome in cases where it is possible to estimate the composition of the reservoir fluids by additional measurements such as representative bottom-hole sample analyses. The accuracy of these methods can be checked, in many instances, by comparison in the changes of the calculated oil and gas reserves over a reasonable period with the intervening oil and gas production.

Acknowledgments

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Developments in Contact Clays

The American Petroleum Institute announces the references to Tables 6 and 7 in "Recent Developments in the Use of Contact Clays," by S. R. Funsten, were incorrectly stated (See "Direct Operating Costs," page 71 of this issue). Table 6 shows data for a modern-type plant and Table 7, data for one of the older-type contact plants.

FROZEN DRILL PIPE

(Continued from Page 43)

freed by the maximum pull of 100 lb. that could be exerted with the equipment. It should be emphasized that the jar required to cause the pipe to freeze was of the very lightest, being nothing more than a couple of light taps on the upper end of the string.

The amount of sand in the hole was reduced until only 1 ft. of the pipe was buried in the sand and stuck. Even on this short length the full tension of 100 lb. could be exerted without freeing it. This gives a shear of:

$$S = \frac{100}{2\ 75\times 12} = 3 \text{ lb. per sq. in.}$$

Applying this shear to 6⅝-in. drill pipe, we get a friction of 720 lb. per ft. of length, or 72,000 lb. per 100 ft. gripped.

Accidentally it was found that, while a slight jar was required to cause the pipe to stick, a slight jar was also effective in freeing it. Pipe stuck as described above, that could not be freed by a steady pull exerted over extended periods, or oft-repeated pulling and slacking off, could be freed immediately by a light pull accompanied by a slight jar. Again it should be emphasized that the jar required to free the pipe was surprisingly light.

At first sight it may appear curious that jarring should both cause the pipe to stick and free it. The action appears similar to the action of slips. If tubing or casing is struck with a hammer when the weight is resting on the spider, the slips will set more firmly. If, on the other hand, there

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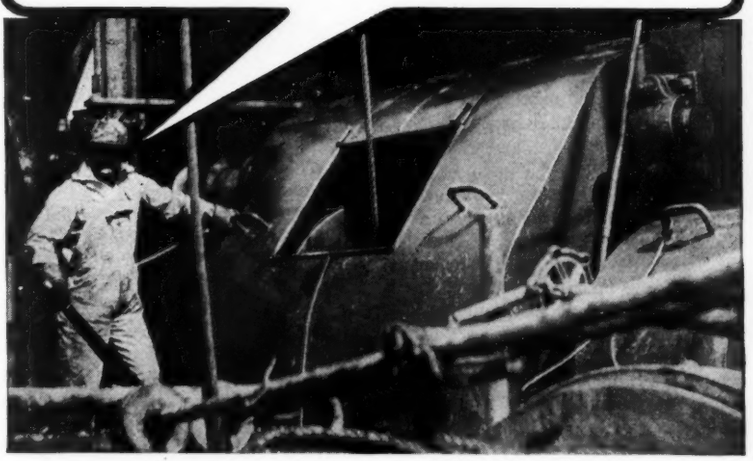

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is tension in the tubing or casing when it is struck, the slips are loosened and the pipe freed.

These experiments were repeated with different sands with similar results.

It often happens that water hammer, caused by a faulty valve or the absence of an effective air chamber, causes vibration in the drill pipe or casing at a well. In the light of these experiments, it would appear that such water hammer is likely to compact any bridges of sand or cuttings already formed, and should be avoided wherever possible. On the other hand, when pipe has stuck and circulation can still be obtained, it would appear that water hammer, intentionally introduced and accompanied by tension, should be one of the procedures used in efforts to free the pipe. Violent water hammer can usually be set up by pinching the pump suction.

Jars and jigger bars are tools often used with success to jar the pipe and free it. The jigger bar is a long, solid steel mandril run on a sand line. A short steel mandril, with water courses to permit circulation, is first dropped in on top of the bit, and is struck of raising and dropping the jigger bar some 40 ft. or 50 ft. upon it.

In order to have a standardized method of producing the slight jarring required to freeze or free the pipe, a small electric buzzer was mounted on the top end of the string. The buzzer is driven by a three-volt battery, the leads being attached to the hose on their way to the battery. When in use, although this buzzer could be heard, the vibration could not be felt by touching the pipe.

H. W. Manley and C. B. Johnson have carried out many experiments with this apparatus. Their complete test results are too extensive for inclusion here, but a few of their findings may be mentioned.

It was found that the friction developed was proportioned to the time the buzzer was on. For instance, using a through 60-mesh, stay-on 80-mesh, sand and 30 in. of plain ½-in. pipe buried, the interfacial shear developed was 1 lb. per sq. in. per 5 sec. that the buzzer was on—the relationship continuing up to the maximum pull of 100 lb. that could be exerted with the apparatus.

Using a 10- to 40-mesh sand and 30 in. of pipe with three collars on it buried, the viscosity of the fluid was changed by the addition of "aquagel" to the water. Table 1 shows the relationship between the viscosity, the time the buzzer was on, and the pull required to free the pipe.

A viscosity of somewhere between 5 and 6 centipoises appeared to be critical. With fluid of this viscosity, under no circumstances with any of the sands tried could the pipe be stuck or any measurable friction developed.

A series of tests was made with cuttings taken from an Oklahoma City well. With cuttings obtained between 2,000 ft. and 5,600 ft. there appeared to be no tendency to stick. Cuttings obtained from 5,600 ft. to 6,200 ft. showed an increasing friction, but the interfacial shears measured did not exceed 0.25 lb. per sq. in. which is, of course, very small compared with sand. These cuttings were next screened so that the grain sizes would correspond with the sands used, but still would not stick the pipe. Under the microscope the irregularity of the grains, sand and cuttings, appeared similar, and the specific gravities were the same, viz., 2.64. The reason for the difference in behavior is so far unexplained, but may be due to a difference in hardness. The screened cuttings were composed, roughly, of 60 per cent shale, 15 per cent limestone, and 25 per cent sand. At the time these tests were made drilling mud from the well from which the cuttings were obtained was not available, and water was used as the fluid. Surprisingly, it was found that the addition of 4 per cent by weight of a native Oklahoma City clay to the fluid caused the pipe to stick—interfacial shears of 3 to 5 lb. per sq. in. being developed.

TABLE 1—EFFECT OF FLUID VISCOSITY ON STUCK PIPE 10- TO 40-MESH SAND

Amount of Gel Material to Water—by Weight (Per Cent)	Viscosity (Centiposes*)	Viscosity, Marsh Funnel (Seconds†)	Time of Vibrations (Seconds)	Pull to Free Pipe (Pounds)	Remarks
0			5	68+	Pipe stock
2	2	30	12	68+	Pipe stock
2	2	30	15	68+	Pipe stock
4	4	33	7	44	
4	4	33	12	68+	Pipe stock
4	4	33	15	68+	Pipe stock
5	8	37	15	8	
5	8	37	20	8	
5	8	37	40	12	
5	8	37	90	20	
6	14	43	15	Free	
6	14	43	40	Free	
6	14	43	90	Free	

*Stormer viscosity at 600 r.p.m.
†1,500 cc. in and 1,000 cc. out.

It is realized fully that these tests were superficial, and that much further experimenting along these lines remains to be done.

The addition of collars (standard ½-in.) to the test string greatly increased the liability to stick, and the interfacial shears developed. A single collar screwed on the bottom of the tubing, with 30 in. buried in unscreened river sand and 5 sec. of vibration with the buzzer, raised the pull required to free from 25 lb. to 100 lb.

Since the scale effect might be expected to affect greatly the results with such a small-scale model, efforts are being made to determine the relative merit—from the point of view of liability to freeze—of collared and flush-jointed pipe by means of full-scale tests. These tests are being carried out at a test well belonging to Spang, Chalfant and Company at Pittsburgh, Pa. A start only has been made with these tests, and they have not progressed beyond the sand and water stage. The following quotation is from a report written by W. M. Frame, director of research, Spang, Chalfant and Company:

"In general, the tests consisted of packing wet sand around three types of 4¾-in. casing joints and measuring the load required to pull the casing out of the sand. The purpose of the tests was to determine the relative loads necessary to free API threaded and coupled casing, extreme line casing, and flush outside-diameter casing.

"Six lengths of 4¾-in. API threaded ends were coupled[4] into a stand of about 57 ft. over-all length. Six extreme line joints of the approximate same lengths were made up. Three plain-end lengths were butt-welded to a flush outside diameter. The joint arrangement of each is shown in Fig. 3 and also in Fig. 4, which pictures a cross-section of the joints in sand. Headers were welded to the bottom ends of each (also shown in the sketches). This was done to prevent sand from getting inside the joints in the hole.

"Two lengths of 9⅝-in. x 43.5-lb. API casing, approximately 5 ft. less than the 4¾-in. casing, were coupled, and a header welded to the bottom coupling to hold the sand. The sand used for these tests was ordinary river sand sifted through a 20-mesh screen, and 20 ft. of each string were buried in the sand for the tests (see Fig. 4).

"The 4¾-in. casing was attached to the hook and pulled by means of the drawworks. The 'hole' out of which the 4¾-in. pipe was pulled was represented by 9⅝-in. casing which was bolted to the derrick-floor beams. The dead line was strung from the crown block and around a snatch block at the derrick floor, and fastened to the hook of a crane scale. The capacity of the crane scale was 10,000 lb.; and, as there were four lines supporting the hook, the maximum pull that could be measured was 40,000 lb. A known amount of wet sand was shoveled into the funnel, shown in the photographs, and allowed to pack by gravity between the two stands of casing. It was found that this method of forming the bridge could be duplicated more accurately than allowing the sand to settle through a column of water. The method of forming the bridge was not considered important for the purpose of these tests, but the ability to duplicate results was considered important.

"The test results indicated that, at least in some instances, the API T and C stand required over twice the load to pull it out of the sand bridge than was required for extreme line casing. Also, the load necessary to free the extreme line casing was about five times that of the flush outside-diameter casing. The test results were not entirely satisfactory due to the erratic results obtained for the T and C stand.

"One very interesting result of the action of the sand was observed. As can be seen in Fig. 5, severe abrasions occurred on the surface of the pipe for a distance of about 20 in. just above each API coupling. Not only was all the scale removed, but the metallic surface was badly scuffed. The darker areas remote from the coupling are patches of tight, hard scale remaining on the pipe. Practically no abrasion was detected on the remainder of the surface up to the next coupling. Also, there was very little abrasion on the surface of the coupling, as can be seen from the photograph.

"The presence of the abraded surfaces indicates that at these locations pressures of great magnitude existed. Apparently the coupling shoulder, as it moved upward, carried along a cone-shaped segment of sand which obtained a reaction from the sides of the hole and packed the sand tighter—thus setting up a great pressure against the surface of the pipe.

"Probably the conditions favoring the formation of these 'sand wedges' are critical (i.e., in the way the sand packed around the couplings, particularly at the top shoulder) for the methods used in these tests, and this may account for the erratic results obtained for this type of joint.

"The abrasion was much less severe on extreme line casing (Fig. 6). The machined surfaces of the joints were painted. Only part of the paint and very little of the scale were removed. There was no scuffing of the metallic surface. The tool marks on the joint can be plainly seen.

"With the flush-joint pipe very little sign of abrasion could be detected."

The test results indicated that the T and C pipe could not be freed with the maximum available pull of 40,000 lb., unless supplemented by vibration induced by striking the pipe with a sledge hammer.

The extreme line pipe, under similar test conditions, was freed with pulls of 17,400 lb., 14,800 lb., and 10,800 lb. on three consecutive tests, or an average of 14,300 lb.

The flush-joint pipe required pulls of 3,200 lb., 2,400 lb., and 3,280 lb., or an average of 2,960 lb.

Pipe Stuck by Boulders

It is not believed that large boulders are responsible for the sticking of pipe. To be heavy enough to stick a string of pipe, a boulder would have to be several feet in diameter. Such a boulder could not fall into a 10-in. or 12-in. hole; and it is

[4]Hereafter in this paper these will be referred to as "T and C" ends.

also difficult to see how it could be disturbed in its socket, sufficiently to move, by the drilling of a 10- or 12-in. hole past or through it. Regarding boulders, C. D. Miller[6] says:

"Frankly, with the exception of a string or two stuck immediately under the surface, I have never seen a string of pipe stuck by so-called boulders. It is quite possible that there are some parts of the country in which this does occur. In the wells where the pipe was stuck immediately below the surface, the pipe was freed by working. In the cases described above, it was necessary to run a second string of surface pipe in order to keep the boulders from getting into the hole."

More briefly, G. A. Collins[6] and C. L. Brewster[7] say:

"No pipe stuck by boulders in our experience."

Of course, a small boulder or pebble may drop into the hole and wedge above a collar or the bit assembly. In such cases the pipe should be easily freed by working and crushing the pebble.

Pipe Stuck by Sand or Cuttings

This probably accounts for the majority of cases of stuck pipe. Bridges may be formed in two ways: by settling, in which case the bridge grows upwards; or, when there is circulation, by a bridge growing downwards in the manner described in an earlier paragraph in connection with the tests made with the small-scale model. Preventive measures are as follows: To keep the mud in proper condition:—If the viscosity of the mud is correct, it will carry the cuttings out and prevent them from collecting at enlargements in the hole and forming a bridge. The tests with the model also indicate that a colloidal material, such as "aquagel," forms a sheath over the particles, and prevents them from packing and getting a grip on the pipe. Proper pits and/or shale shakers are also of importance to reduce the amount of sand and cuttings in the hole. On this matter, J. E. Warren[8] says:

"Mud conditions, design of pits, and use of a shale shaker are the most important things to take into consideration in an area where cuttings and cavings are responsible for stuck pipe. Cuttings will lodge in washed-out pockets or solution pockets in salt where the size of the hole has been considerably increased over its drilled diameter. These places represent points of reduced velocity in the circulating drilling fluid, with resulting deposition of cuttings. The cuttings are kept buoyed up while circulating, but will tend to settle down around the drill stem when circulation is cut off, and may stick the pipe. Conditioning the mud to reduce washing out by using wall building materials and saturated brine solutions in salt materially reduces trouble of this kind."

Again, Ralph Will[9] says:

"One of the chief preventatives for avoiding being stuck by cuttings or cavings is to be sure that the bit is hoisted off bottom always before the mud pump is shut down. A heavy mud at high viscosity, and the hole kept full while making a trip so as not to lower the wall pressure, are some of the most effective measures to observe. Increasing the rate of circulation as much as possible will carry cuttings from the hole at a higher rate of speed and avoid 'sifting back' of the cuttings. Ordinarily, cases of so-called caving will be avoided by keeping the fluid level at the surface while making trips."

On the same subject, C. J. Gibson[10] have to say:

"Keep mud in proper condition, and I would not restrict drilling speed or amount of hole per hour. In a hole that is caving, it is best to leave off reamers and all drill collars that are not necessary."

Should the pipe become stuck, in spite of all precautions, efforts to free it should be directed along the following lines: If circulation can still be obtained, intermittent starting and stopping the pumps should be the first thing tried—the pressure being released each time the pumps are stopped and tension held in the pipe. If this does not succeed, an effort should be made to induce vibration, which may be done by pinching the suction of the pump to cause water hammer. It is, of course, important to hold tension in the pipe continuously while there is any vibration; because, as has already been shown, vibration without tension tends to stick the pipe all the tighter. If these efforts fail, the next step would appear to be to spot or circulate oil. All correspondents were agreed upon the value of oil spotting, although there appears to be disagreement as to the proper method of carrying it out. The following quotations, it is believed, describe the best practice:

According to Brewster and Collins:

"Loosening stuck drill pipe with oil: If circulation is had, pump in measured volume of oil, usually 25 bbl. to 50 bbl., followed by mud to place oil around bit, leaving an excess of oil inside of the drill pipe. Hold strain on the pipe; and, if same does not come loose in a reasonable time, start up pump for several strokes to pump fresh supply of oil around bit. Then release bleeder on pump to surge oil back through the bit, and continue to hold strain. If this spotting of oil does not result in loosening of the stuck drill pipe in a reasonable time, circulation of oil is then resorted to if possible."

J. E. Brantly[11] states:

"When pipe begins to stick or begins to pull hard, provided the bit is not on bottom, it should, of course, be slacked off in an attempt to force it downward. It should then be rotated and circulated. If the pipe is stuck with shale, the most effective means of freeing is by spotting oil. This we generally do by pumping in 30 bbl. or 40 bbl., displacing about one-half of it into the area where we assume the pipe to be stuck, which is generally at the bit. At 15-min. intervals we move about 1 bbl. from the drill pipe or past a given point in the hole. A strain is held on the pipe continuously, which strain was taken before the oil was spotted. Ordinarily, the pipe will come loose after a few hours. The circulation of oil is sometimes resorted to of necessity, although it should always be avoided, if at all possible, because of the very harmful effect to the walls of the hole. If the pipe is stuck by sand and circulation is possible, we have found that the most effective means of freeing the pipe is by circulating a 1-per-cent or 1½-per-cent 'aquagel' solution. The spotting of oil will likewise frequently free the pipe when stuck in sand; but, because of its harmful effect to the walls of the hole and the mud, it is to be avoided."

According to Gibson:

"First determine where pipe is frozen. This can be done by taking a tension on the pipe. Oil can be pumped to the bottom of the hole, and let set for an allotted time; and, if the pipe is not free, keep moving the oil up the hole at the rate of about four strokes of the pump every 20 min."

It is believed that some of the success attributed to the circulation of oil in the past was really due to the stopping and the starting of the pumps, which is involved by the operation of oil spotting; and that oil spotting or circulation should not be resorted to until conditioning of the mud, alternate stopping and starting of the pumps, and water hammer have been given a thorough trial. When working with the experimental apparatus, it was noticed that if a bubble of air accidentally got into the circulating system, it was very effective in breaking down any bridge and freeing the pipe; and, in this connection, it is interesting to note that J. E. Warren says:

"When high-pressure gas is available, it is sometimes possible to 'slug' the gas with the mud through the drill stem and by the increased velocity to free the pipe in this manner. If any of these methods are not successful, in my opinion the only alternative is to wash over and cut the pipe out in sections."

If circulation has been lost, the procedure would appear to be to pull tension in the pipe and jar by means of the jigger bar or with water hammer. Even when there is no circulation, considerable vibration can be caused by stopping and starting the pumps while opening and shutting the blow-off.

Caving and Sloughing

The walls of the hole sometimes cave or slough, and cause sticking of the pipe. Prevention and cures are similar to those for trouble due to sand and cuttings, which have already been discussed.

Key Seating

This is a trouble that appears to be on the increase, and occurs especially in the deep wells drilled through the softer formations. J. E. Warren describes it in the following words:

"I believe that another major reason for stuck drill stem is the 'key seating' of a crooked hole. Pipe stuck by this reason may result in a tedious expensive fishing job. Where a hole deviates from the vertical as little as 4 deg. and straightens up on drilling deeper, a portion of the hole must act as a bearing for the drill stem. When a depth has been reached so that this point of bearing is opposite drill stem under tension, a definite pulling effect on the formation results. Rotation combined with circulation enables the drill pipe itself to drill a 'key seat' into the wall if the formation at the point of bearing is of a character to permit it."

In addition to the wearing of the slot during rotation, described by Warren, it appears probable that the groove is cut by the sawing (broaching) action of the collars on the string of pipe during going in and out of the hole. This would not occur with flush-joint pipe, but no information is available as to whether or not key seating does occur with flush-joint pipe. Regarding preventive measures, Warren goes on to say:

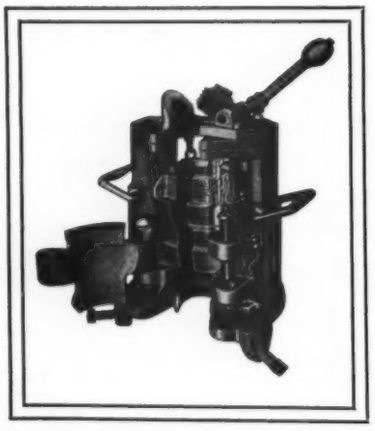
"Keep the hole straight. At Rodessa it has been found advisable to restrict the deviation from vertical to 1 deg. or less. If key seating does develop, to run a reamer in the drill stem at this point to keep the 'key seat' reamed out to full diameter."

It would appear possible that the top of the drill collar or of the reamer, if one is used, could be designed in such a manner that upon rotation it would tend to work the assembly out of the key seat. Should the pipe become stuck by pulling the bottom assembly into the key seat, and be unable to be loosened by slacking off, the jigger bar is a most effective tool for knocking it loose.

Of course, when knocked loose, the trouble is not over, as the bit assembly will probably again stick in the slot when an effort is made to come out of the hole. Rapid rotation while pulling up will, if there is any out of balance in the bit assembly, sometimes throw the pipe out of the slot and permit extraction. In some cases before cutting, it would appear worthwhile to set the string down on bottom and slack off with a view to kinking one or more of the lower standards. Rapid rotation while raising may then pull the pipe out of the slot. All else failing, the usual procedure is to knock the pipe loose, cut a few joints above bottom, run a reamer and

[6]C. D. Miller, general superintendent, production dept., Barnsdall Oil Co.
[6]G. A. Collins, member of California District Committee on Drilling and Production Practice.
[7]C. L. Brewster, drilling superintendent, Shell Petroleum Co. of California.
[8]J. E. Warren, drilling superintendent, Carl B. King Drilling Co.
[9]Ralph Will, general superintendent, Rocky Mountain Drilling Co.
[10]C. J. Gibson, assistant general superintendent, Rocky Mountain Drilling Co.
[11]J. E. Brantly, consulting engineer, Los Angeles, Calif.

IT MEANS STOP —SAFETY FIRST



—and to the pulling gang, the O'Bannon Model 8 Tubing Spider also means fast, carefree, dependable operation.

So automatic is this useful tool that it is almost human in its operation —and so sturdy that it is good for years of ordinary use. It can be used with any casing head, and any size of tubing.

Because of its many marked advantages—and above all, because of its safety features—use the O'Bannon Model 8 Spider. Request a demonstration —on your property—or order a spider from

YOUR SUPPLY STORE

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Tulsa, Oklahoma

O'BANNON Safety TUBING SPIDER

ream out the key seat and, finally, fish out the pipe and bit assembly left in the hole.

Sticking by Balling Up

Drill pipe, and occasionally casing, stick when being pulled from the hole by the collection of sticky material on the collars and the bit assembly. The trouble is caused by the condition of the mud. A *Drilling Mud Handbook*[12] describes the trouble as follows:

"Open-Hole Diameter Decreased by Wall Thickness:

"Many times when running in casing there will be a point in the open hole below which the casing cannot be lowered, even though the hole had been reamed to a diameter which should allow ample clearance. There can be no accounting for the decreased diameter of hole except through the filtering out of a thicker wall than that normally expected. These stuck-casing incidents always occur in wells which have been using muds low in gel-forming colloids just prior to the setting of casing.

"The foregoing holds true for cases where a bit becomes stuck and cannot be drawn through the hole which it has just drilled. Here the wall above the bit continues to increase in thickness until the formation is completely sealed off against filtration; and, if the formation is a porous one, or if the mud is high in total solids, the hole becomes so chocked up with wall that there is no longer clearance for the bit. Such walls slough off or are knocked off by the bit or drill pipe, but are again built up to their original thickness as long as the same type mud is used."

Preventative measures are to condition the mud and to increase the rate of circulation. What may be called proper mud will vary according to the district, but a 15-centipoise mud with 2 per cent by weight of a gel-type colloid is, in general terms, a suitable drilling fluid. Before coming out of the hole, the circulation should be continued without drilling until the bit assembly is clean and free; and if at any time while coming out it shows signs of sticking, circulation should be resumed until the trouble is cleared. The cure also lies in conditioning the mud, if circulation can be obtained; and, if this is not successful, oil circulation should be resorted to.

Collared and Flush-Joint Pipe

The tests with the small-scale apparatus and the full-scale tests at the Spang company well in Pittsburgh indicated that collared pipe was more likely to stick than flush-joint. Of the 28 replies received to the question: "which do you consider least likely to stick, collared or flush-joint pipe?" 27 answered: flush-joint pipe.

Fig. 4—Percentage Figures by Volume

Charge:	
Coastal lubricating distillate 100.0 per cent:—	
Gravity, deg. API	19.5
Viscosity, Saybolt Universal at 210 deg. F., sec.	72.7
Viscosity index	3
Carbon residue, per cent	3.35
Furfural Extraction:	
Apparatus:	
15-ft. glass countercurrent extraction tower—	
Packed length, ft.	12.0
Packing material	½-in.x½-in. stainless-steel rings 25-gage
Time of run, hours	88.0
Charging rate, gal. per hour:	
Oil	3.02
Solvent	8.01
Total	11.03
Furfural used:	
Per cent by volume oil charged	264.7
Temperature, deg. F.:	
Oil	165
Solvent	207
Refined-oil mixture layer	203
Extract mixture layer	183
Oil jacket:	
No. 1 (bottom)	178
No. 2	193
No. 3	208
No. 4 (top)	225
Height of interface from bottom of tower, in.	31.0
Difference in overflow levels, in.	24.0
Solvent: per cent before reducing:	
Refined-oil layer	11.4
Cycle-oil layer	11.7
Extract layer (after cycle-oil separation)	88.8
Separation of cycle-oil layer	
Temperature, deg. F.	140
Tim, min.	15
Solvent-refined Oil 59.7 Per Cent:	
Gravity, deg. API	25.2
Viscosity, Saybolt Universal at 210 deg. F., sec.	66
Viscosity index	60
Carbon residue, per cent	0.09
Cycle Oil 7.7 Per Cent:	
Gravity, deg. API	19.8
Viscosity, Saybolt Universal at 210 deg. F., sec.	76
Viscosity index	5
Carbon residue. per cent	0.34
Extract 32.6 Per Cent:	
Gravity, deg. API	10.1
Viscosity, Saybolt Universal at 210 deg. F., sec.	150
Carbon residue, per cent	1.80

It sometimes happens that, due to one cause or another, pipe cannot be moved for a while; and the question arises as to whether, in order to prevent the pipe sticking, it is better to continue or stop circulation. To this Phillip Taber[13] replies:

"It is better in practically all cases to shut off circulation, occasionally starting the pumps for a moment, to prevent plugging of the bit by cuttings settling upon it. The only exception is when drilling through shallow sands with very thin drilling fluids, under which circumstances it is probably better to continue circulating."

Stickle and Elias agree with this recommendation.

[12] Baroid Sales Co., *Drilling Mud Handbook*, Los Angeles, May, 1931.
[13] Phillip Taber (partner) Taber and Coleman, drilling contractors, Tulsa, Okla.

Heaving Shale and Blowouts

The sticking of pipe by heaving shale or due to blowouts is considered to be outside the scope of this paper.

Acknowledgments

Acknowledgement is due to Messrs. H. W. Manley for continuous help given in the preparation of this paper, to C. B. Johnson, Jr., for the work carried out with the test model, and to Carl Reistle, chairman of the Institute's Committee on Drilling Practice, for the assistance given in collecting information from various drilling superintendents and contractors, and to Spang, Chalfant and Company and the Baroid Sales Company for experimental work done, and to the many correspondents who have furnished information.

TOWER UNIT

(Continued from Page 47)

operate satisfactorily on any solvent for which the separating rate of the extract mixture from refined-oil mixture at any stage is sufficiently rapid to permit operation of the tower at reasonable capacity. For example, it will operate on chlorex (β, β-dichlorethyl ether), phenol, furfural, and various solvent mixtures, with proper variation in the solvent ratios and operating conditions to take care of various properties of the particular solvent and oil employed. Although this paper is intended to describe a tower rather than to offer comparisons of the effectiveness and advantages of various solvents, a brief outline of the typical conditions that prove satisfactory for the operation of the extraction tower on furfural are given hereinafter, primarily with the thought that these data will tend to clarify the mechanical details of tower operation (Fig. 4).

Acknowledgment is due a number of associates for assistance in construction and working out of the best operating details for this unit, particularly to Messrs. Albert S. Orr and H. L. Pagett.

We also have built and have in successful operation an experimental tower of still larger size for study of solvents under pressure, fundamental details of which remain the same as for the unit described, except for the use of steel tubing instead of glass, with necessary glass level gages and valve control of pressure operation.

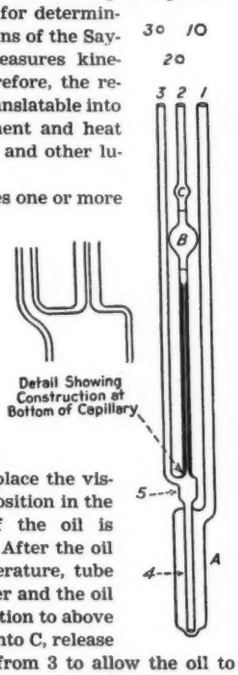
QUESTIONS ON TECHNOLOGY

By Charles K. Francis, Ph.D., Technical Editor

Suspended Level Viscosimeter For Lubricating Oils

Would appreciate information concerning a suspended level viscosimeter for use with lubricating oils. What is this instrument and what authority is there for its use?—H. B.

The suspended level viscosimeter is described in a proposed A.S.T.M. method of test for kinematic viscosity. This instrument was developed to permit a more accurate method for determining viscosity than by means of the Saybolt viscosimeter. It measures kinematic viscosity and, therefore, the results are more directly translatable into friction, power requirement and heat development in bearings and other lubricated surfaces.



The apparatus includes one or more calibrated glass viscosimeters, bath, thermometers and timer. The figure shows an instrument with one capillary. The reference contains all detailed measurements. The efflux time should be more than 80 seconds up to 700 seconds.

The procedure is to place the viscosimeter in a vertical position in the bath. About 10 ml. of the oil is charged into tube No. 1. After the oil has attained bath temperature, tube 3 is closed with the finger and the oil drawn into tube 2 by suction to above the upper mark, partly into C, release suction, remove finger from 3 to allow the oil to flow freely from the capillary, observing the seconds required to pass from upper to lower mark.

Centistokes shall be calculated from (1).

$$V = Ct - \frac{1.0}{t}$$, where V = the kinematic viscosity in centistokes, t = efflux time in seconds, and C = determined calibration constant for the instrument. The value $\frac{1.0}{t}$ is the correction for kinetic energy, the constant 1.0 being determined by the design of the instrument.

The viscosimeter shall be calibrated, for which this may be used: (b) Efflux time for pure water at 100° F. shall be determined in viscosimeter No. 1. The constant found at 100° shall be valid for use at other temperatures. Calibration constant C (water) shall be calculated as follows:

$$C\ (\text{water}) = \frac{0.689}{t} - \frac{1.0}{t^2}$$

then C for oils by multiplying C (water) by 1.0035. The value 0.689 for k.v. of water at 100° F. is based on 0.684 for the absolute viscosity. Factor 1.0035 is to correct for difference in surface tension of oil and water. Value 1.0 is the kinetic energy correction.

An oil which gives an efflux time at 100° F. of not less than 150 seconds in viscosimeter No. 2 shall be used for inter-comparison. The k.v. of this oil shall be determined in viscosimeter No. 1, using the value for C as defined. The efflux time at 100° F. for this oil shall then be determined in viscosimeter No. 2, from which the constant for viscosimeter No. 2 shall be calculated from (2):

$$C = \frac{\text{k.v. of oil used}}{t} - \frac{1.0}{t^2}$$

References: A.S.T.M. Standards on Petroleum Products, 1936, page 15. C. G. Fitzsimous, A Rapid Precision Viscosimeter, Ind. Eng. Chem., Anal. Edn., 7, 345, 1935. L. Ubbelohde, The Simplest and Most Accurate Viscometer and Other Instruments with Suspended Level, J. Inst. Petrol. Tech., 19, 376, 1933. L. Ubbelohde, The Suspended Level Viscometer, same, 22, 37, 1936.

Substances Used for Depressing Pourpoint of Oils and Greases

Do you know of a chemical introduced as an agent to depress the pourpoint of oils?—G. S. K.

Degras, or wool fat, has long been used for depressing pourpoint of oils and greases. Some claim has been made that the fatty acids present are the active agents, at any rate, various compounds of oleic, palmetic and stearic acid have been suggested for the purpose, of these probably the aluminum compound is best known. A remarkable substance is Paraflow, a synthetic hydrocarbon which, according to U. S. Patent No. 1,815,022, is a condensation product of an aliphatic and aromatic hydrocarbon. One per cent of this material when blended with an oil showing a pourpoint of 30° F. caused the pourpoint to fall to below minus 5° F.

CHEMICALS FOR THE PETROLEUM INDUSTRY

Soda Ash

(Anhydrous sodium carbonate)

Use—Treating, water purification, grease making, washing bottles, etc.

Form—Grayish to white powder.

Formula—Na_2CO_3.

Molecular weight—106.

Specific gravity—2.43-2.51.

Soluble, water, per cent—cold, 7.1; hot, 45.4.

LIMITATIONS

(After drying 1 hr. at 311° F.)

	Per cent
Total alkalinity, as Na_2O, min.	58.00
Purity, min. Na_2CO_3	99.20
Sodium hydroxide, max.	0.10
Bicarbonate, max.	0.50
Insoluble, water, max.	0.25
Sulfur, as Na_2S, max.	0.10
Weight loss, at 311° F., 1 hr.	1.00

There are two grades, A and B. A is 58 per cent, ordinary (or light) and B is 58 per cent, dense. The volume of 30 grams of A shall be 55 to 65 ml.; and that of B from 30 to 40 ml.

Reference: Federal Stand. Stock Cat., O-S-571.

Reduction of Sulfur Content of Gasoline Distillates

Can you tell me what proportion of the sulfur content of any given gasoline distillate is customarily removed by the treating processes in general commercial use? Is it true that the production of high sulfur bearing crude is of necessity showing an increase?—R. T. P.

It is fortunate that the larger part of the crude oil of the United States is known as sweet oil, meaning it does not have an objectionable odor and contains only small quantities of sulfur. In most instances the sulfur content is not high enough to require a special treatment of the gasoline fraction to reduce the sulfur content to 0.1 per cent, as required to meet standard specifications for motor fuel. The usual practice is simply to sweeten the straightrun gasoline for removal of the mercaptans. Most refiners do treat the distillate from the pressure stills for reduction in the percentage of sulfur.

The quantity of sulfur may vary in petroleum from a trace up to in excess of 5 per cent but most oils contain under 2 per cent. Usually the percentage of sulfur increases in the fractions obtained from the crude oil as the boiling point rises. This results in the sulfur being concentrated in the heavy oil residue. A crude oil containing 0.4 per cent yielded on distillation a raw distillate fraction with a sulfur content of 0.02 per cent, but the fuel oil contained 0.76 per cent, being equivalent to nearly half of the total quantity in the crude oil. Specific data for raw gasoline above and below 0.25 per cent are not available.

Sulfuric acid is the best known reagent for sulfur reduction of petroleum distillates so most of the data on sulfur removal are based on the action of this acid. The temperature of the distillate while being treated should be low for with elevation of temperature there is a tendency to form sulfonated products causing an increase in sulfur content. It has been established that there is no relation between total sulfur and the quantity of acid required; apparently similar oils may need different quantities to produce the same results. Examples: A cracked distillate containing 0.9 per cent sulfur after treatment with 40 pounds of 93 per cent acid per barrel contained .2 per cent sulfur. Another report shows a similar distillate to be reduced from 0.3 per cent to 0.09 per cent with 20 pounds of acid.

Aside from the fact that the first oil produced in Pennsylvania was exceptionally low in sulfur, there is no evidence to show that the oils now being produced are gradually increasing in sulfur content.

Questions on Petroleum Technology may be sent to Dr. Charles K. Francis, The Oil and Gas Journal, Tulsa, Okla. When a copy of the answer is desired postage should be enclosed.

PROBLEMS FROM READERS

Edited by L. G. E. Bignell

Relative Producing Areas

When oil pools produce from several underlying sands, does the underlying sands cover more productive territory than the upper producing sands?—L. F. E. M.

Generally speaking, the lower producing formations in an area where several producing horizons have been found will cover less area than the upper producing zones.

This can be very easily demonstrated. The predominating type of producing structure is a dome or anticline. Such structure is produced by folding.

The sedimentary beds were laid down horizontally, or nearly so. Such beds may be represented by the several pages in a book or magazine. If a book or magazine is laid down and then the pages pushed together from opposite edges the center portion of the book or magazine will tend to fold upward. This is a simple demonstration of the manner in which nature produced structural folds —by applying lateral pressure to beds of sediments.

After the fold has been formed in your paper or magazine, you will note that the lower folds are more sharply bent than the upper ones and the distance across the fold is more when two opposite points on the outside of the fold is measured than it is on the inside. This difference equals the thickness of the paper displaced in making the fold. The same is true of folded sediments, and where they are several hundred feet thick the inner strata will present a very much smaller area for the accumulation of gas, oil and water than the outer strata.

In using sheets of paper to demonstrate this general theory the question might well be raised as to why the lower strata are not saturated over as large an area as the upper ones, for it is quite evident the sheets of paper are all of the same size and thickness. As a matter of fact, there are exceptions to the general rule that the lower formations form smaller gas and oil reservoirs than the upper ones. In Salt Creek, Wyoming, the Second Wall Creek sand covered a much larger area than the First Wall Creek sand which was above the Second. These variations in gas and oil accumulation will be governed by local conditions.

The folding of horizontal beds of sediments is by no means uniform. Perfect anticlines are rare. One leg of the structure will usually form a more acute angle than the other and under such condition the relative position of oil and water contact will vary on the opposite sides of the dome, being higher on the side of steepest inclination of the beds.

Another factor entering into oil accumulations under conditions such as outlined will be the difference in porosity and permeability of the different strata. It is easily demonstrated that with all other conditions the same, the upper beds will be more open or porous than the lower beds because of the folding. When laid down horizontally it is assumed each bed covered the same area. Thickness might have been a variable but under the conditions under consideration the area will be the same.

If these horizontal beds are then deformed by the exertion of pressure at their edges and are folded upward the upper beds will have to cover more area when they finally come to rest at the top of the anticline or dome. This condition will bring about an opening up of the spaces between sand grains and therefore greater porosity. It is also probable faults and fissures will be developed which may cut through all of the beds and in this way communication will be established between the lower and upper beds. Under such conditions with the lower beds under greater compression stresses and being more compacted, the tendency of the gas and oil will be to move upward along the fault planes to the upper beds where the compression stresses are less and the pore space more plentiful. Gas and oil always tend to move from points of high to point of low pressure, and in this case the differential in pressure is in favor of the upper strata and the migration would be upward, thus draining the lower formations of a portion of their hydrocarbon accumulations.

Drill Stem Used in Oklahoma City

What is the average size drill stem being used in the Oklahoma City oil field now?—I. H. C.

There are 15 drilling wells reported in Oklahoma City at this time. As they are mostly inside locations haste is not essential and the rotary holes are being drilled with 4½-inch O.D. 13.75-pound-per-foot drill stem and after string of 7-inch has been set the hole is drilled into the sand using 3½-inch O.D. drill stem.

During the height of the drilling activity in Oklahoma City when haste was the essence of all contracts the holes were drilled with 6⅝-inch O.D. drill stem and drilled in with 4½-inch O.D. drill pipe.

For a rather detailed report of equipment used in Oklahoma City field you are referred to U. S. Bureau of Mines Tech. Paper 561, by Gustav Wade, on "Mechanical Equipment Used in the Drilling and Producing of Oil and Gas Wells in the Oklahoma City Field." Copy may be obtained from the Government Printing Office, Washington, D. C.

Drilling Practice in Illinois

Kindly advise if you have had any articles in The Oil and Gas Journal relating to drilling practices in the various Illinois pools, showing pipe programs, approximate drilling contract costs, caving conditions, time required and structural formations?—E. C. F.

There has been delay in answering your letter because we were awaiting the return of James McIntyre from Illinois to secure the latest information about conditions there. We refer you to current and recent issues of The Oil and Gas Journal for reports on general conditions in Illinois.

Up to date there have been no deep tests started in the Illinois Basin which we assume you are asking about for the older pools have been drilled up for many years.

You are specifically referred to the issue of The Oil and Gas Journal dated April 29, 1937, in which you will find a special article on Illinois activities by James McIntyre.

Solubility of Different Forms of Sulfur

Is the lump form of sulfur soluble to the same extent as the powdered sulfur?—J. J. D.

Sulfur is one of the few elements that is known in several physical states in the pure condition. These forms may be distinguished by the shape of the crystals, absence of crystals and solubility. The common form in which sulfur is used in commerce is the roll or lump. This is obtained by heating the ore and then pouring the melted sulfur into molds or bins.

When sulfur is heated above its melting point and the hot vapors directed against a cold surface, the sulfur will be deposited as very small crystals called flowers of sulfur. In the method of extracting sulfur from some ores, the vapors pass from a retort to a chamber where at first flowers of sulfur collect but as the process continues, the walls of the chamber become heated so that the sulfur melts, runs to the bottom, and is withdrawn into molds. When sulfur is kept above its melting point for some time amorphous sulfur is formed. This form of sulfur is not soluble. When the powdered sulfur is "flowers of sulfur" it is clear that there may be more or less amorphous sulfur present so that the solubility of the entire mass will be reduced to the extent to which this form of sulfur is contained in it.

Sometimes the lump sulfur is powdered by mechanical means, and of course this powdered sulfur is soluble to the same degree that the original material is.

In a general way it may be said that the lump sulfur is more soluble than the powdered form, because much of the so-called powdered sulfur is flowers of sulfur.

What Is a "Commercial" Well?

Will you please define a "commercial" oil well? And what is the minimum potential barrels it must produce to be so named?—A. S. J.

It is rather hard to define a commercial oil well except to say that any oil well that will pay for the cost of drilling and for the cost of producing the oil and yield a profit upon the entire investment may be classed as a commercial well.

The quantity of oil such a well would have to produce would vary with the circumstances under which it is found and the price of oil and many other factors. Some wells producing a few quarts of oil per day are still being produced and yield a profit to the present owner but such wells might be abandoned if the ownership was transferred to another.

There are thousands of wells now being produced which do not actually pay for their upkeep but the oil is desired regardless of the market price quoted. The oil from such wells is usually used by the producers in their refineries and the cost of operating a group of wells in a district may show a profit while many individual wells are operated at an actual loss.

There is no definition which will properly describe all classes of commercial oil wells excepting that they should show a profit on the capital investment and operating costs.

FIELD OPERATIONS

Summarizing the Week's Developments

Two large producers were completed in the Billings pool, Noble County, Oklahoma. Two shallow wildcats in Kiowa County were showing as pool openers. A second deep test on the Centrahoma structure in Coal County was begun, and work was started at an Ordovician test near the shallow Brock pool in Carter County.

KANSAS

Total daily average production passed the 200,000-bbl.-daily mark, highest in Kansas history. A large area was opened to development with completion of a producer about midway between the Silica, Ellinwood and Peter pools, Barton County. A wildcat pool opener in Barton County was completed with potential of 1,904 bbls. of oil daily.

TEX-LA-ARK FIELDS

The new Schuler field in Union County, Arkansas, held the attention of operators when its second well came in flowing 940 bbls. of 43-gravity oil in 13 hours from Morgan sand, a lower member of the Travis Peak. One hundred and thirty-one drilling permits were issued by the Louisiana commission in May. An 8,000,000-foot gas production was developed in the Pettit lime, (Basal Glen Rose), in a test in the Cass County, Texas, portion of the Rodessa field. This is a deeper horizon than the field's oil sand.

TEXAS

Commercial production was found in the Conroe sand in the Segno field, Polk County, Texas. A 1,082-bbl. well in the Cotton Lake field, Chambers County, establishes a record to shoot at in that area. A probable new pool in Nueces County in Southwest Texas was a feature of the week in that part of the state. The discovery well in northeastern Fisher County, West Central Texas, estimated all the way from 1,000 to 3,000 bbls. potentially should be completed this week. One of the 10 active wildcats in Jones County has penetrated an oil sand in section 53, O.A.L. Survey, which may develop a pool-discovery well. Another producing well in northern Winkler County helps to link the Eaves pool in Lea County, New Mexico, with production in Winkler. Reports from the East Texas field say that the recent 8-cent crude oil price increase has forced some independent purchasers to raise their premium price from 5 to 10 cents in order to hold connections. Meanwhile activity in the East Texas field is on the increase.

NEW MEXICO

A wildcat 2 miles east of lime production and 1 mile south of sand wells in the Jal area in Lea County, New Mexico, flowed 153 bbls. of oil in two hours after acidizing and opened a new area. A 13,748-bbl. well was completed in the Hobbs field by Stanolind Oil & Gas Co. A Chaves County wildcat was plugged and abandoned.

CALIFORNIA

The Wilmington field in Los Angeles Basin, California, is being developed so rapidly that it has been contributing nearly half of the excess production of the state. Efforts are being made to get the operators together on a curtailment program. The field however has been given a 18,000-bbl. daily quota in June or 5,000 bbls. a day higher than in May .

MICHIGAN

Allowable production per well in the Buckeye field in Gladwin County, Michigan, is steadily decreasing as new prolific wells are completed. Allegan County's new 1,000-bbl. well is attracting much attention to that western Michigan field.

Completions in All Fields

(Week Ending May 29, 1937)

	Oil	Gas	Dry	Total	1937 total comp. to date	1936 total comp. to date
N. Y., Pa., W. Va.	58	22	6	86	1,521	1,357
Ohio	12	10	5	27	400	123
Indiana	0	0	0	0	40	66
Kentucky	11	2	6	19	143	86
Illinois	2	0	0	2	27	21
Michigan	16	3	4	23	356	305
Kansas	56	5	16	77	952	614
Oklahoma	29	1	18	48	1,130	949
Texas:						
North Central Texas	37	2	28	67	1,122	1,126
West Texas	48	0	0	48	1,043	549
Texas Panhandle	6	3	0	9	266	287
East Texas	36	0	3	39	857	1,130
East Central Texas	19	0	2	21	274	121
East Texas Border	6	1	1	8	171	24
Gulf Coast Texas	30	2	9	41	573	453
Southwest Texas	42	2	12	56	1,343	1,148
Total Texas	224	10	55	289	5,649	4,838
North Louisiana	10	0	4	14	260	276
Gulf Coast Louisiana	1	0	1	2	192	157
Total Louisiana	11	0	5	16	452	433
Arkansas	2	0	1	3	54	38
Montana	4	0	0	4	57	68
Wyoming	3	0	0	3	40	34
Colorado	0	0	6	0	6	13
New Mexico	10	1	3	14	310	203
Utah	0	0	0	0	0	4
California	27	0	4	31	589	448
Total United States	465	54	123	642	11,726	9,600
Total previous week	455	40	119	614		
Difference	10	14	4	28		

Outstanding Fields—Highlights

(Week Ending May 29, 1937)

FIELD—	Rigs up	Wells drlg.	Weekly oil completions	Initial prod.	Total No. oil wells	Daily av. prod.
TEXAS						
Amelia	5	11	3	1,001	32	3,439
Hastings	4	12	7	4,267	181	14,387
Flour Bluff	0	8	1	170	48	3,900
Saxet	5	38	7	990	451	36,100
Lopez	1	3	3	310	335	8,380
East Texas	57	119	36	1,288	21,042	467,653
Talco	6	30	14	4,902	337	30,312
Ector County	23	91	11	6,919	421	20,700
Winkler County	23	68	16	19,887	1,244	43,100
OKLAHOMA						
Oklahoma City	2	15	0	0	1,114	165,275
Fitts	2	54	10	9,332	743	101,775
Olympic	0	14	6	277	353	14,200
KANSAS						
Ellis County	9	30	7	11,091	109	7,050
Reno County	4	28	6	3,110	424	19,870
Russell County	14	61	8	7,853	693	31,525
Rice County	10	64	10	9,036	849	50,960
NEW MEXICO						
Lea County	16	96	10	15,712	2,164	112,470
LOUISIANA-TEXAS						
Rodessa, La.	3	14	2	774	376	49,575
Rodessa, Tex.	5	30	5	2,047	280	42,300
Lisbon, La.	10	19	4	2,736	24	6,810
MICHIGAN						
Buckeye	41	68	13	10,049	100	17,225

Eastern Field Report

By STAFF CORRESPONDENT

FIELD RESULTS ARE LIGHT IN PENNSYLVANIA GRADE AREA

PITTSBURGH, Pa., May 31.—Thirty-nine operations were completed in the lower eastern fields during the past week of which five were dry, 21 gas wells, and 13 oil producers with an initial production of 198 bbls. Most of the new production was in Southeast Ohio. In West Virginia several Oriskany gas wells were completed.

SOUTHWEST PENNSYLVANIA

Three oil wells and two gas wells were completed in Southwest Pennsylvania. In Amwell Township, Washington County, Union Gasoline & Oil Corp. deepened the gas well No. 1 on the A. O. Vankirk farm to 3,112 feet and it is estimated good for 30 bbls. a day. The Fifth sand was at 3,084 feet with oil at 3,097-3,100 feet.

In South Franklin Township, Washington County, Dunn Mar Oil & Gas Co. completed No. 2 J. T. Baldwin in the Fifth sand at 3,018 feet. It is good for 4 bbls. daily.

In Mount Pleasant Township, Washington County, the Dempsey Oil Co. completed a test on the John Seabright farm in the Hundred-Foot sand at 2,150 feet. It is a 250,000-foot gas well.

In Greene County, the Dun Mar Oil & Gas Co. deepened No. 2 Kuhn heirs in Freeport Boro (Springhill Township) to 3,360 feet, Fifth sand. After a shot, it is good for 1 bbl. a day. In Richhill Township, Natural Gas Co. of West Virginia completed the test on the J. S. Johnson farm at 2,849 feet. The Nineveh Thirty-Foot sand was at 2,626-73 feet with 35,000 feet of gas at 2,630 feet; the Fifth sand was at 2,832-40 feet, with gas at 2,833-36 feet gauging 100,000 feet a day. In the same township, this company is fishing for tools in the test on the O. M. Grinnage farm at 2,290 feet, and Manufacturers Light & Heat Co. is drilling at 2,525 feet on the Ward Chambers farm.

In Center Township, Greene County, Charles Mong and others have reached the top of the Nineveh Thirty-Foot sand in the test on the J. L. Metz lease at 3,280 feet and is cementing the break above the sand. The South Penn Oil Co. has completed the rig for the Samuel Harvey No. 11.

In Aleppo Township, Greene County, Cochran & Cochran have reached 1,720 feet in No. 3 on the John Strope farm. In Wayne Township, H. D. Freeland & Co. are drilling at 2,035 feet on the D. L. Freeland No. 3.

In Morris Township, Washington County, Parkinson, Dague & Co. are deepening No. 1 on the M. B. Rogers farm and have reached 3,016 feet.

In Amwell Township, Washington County, Peoples Natural Gas Co. has made a location on the Walter E. Redd farm. The Union Gasoline & Oil Corp. is drilling at 1,100 feet on No. 6-A O. Vankirk. Carnegie Natural Gas Co. has completed rig for No. 2 Farabee. The South Penn Oil Co. is drilling at 2,032 feet in No. 5 J. Q. Zimmerman.

In South Franklin Township, the Carnegie Natural Gas Co. has made a location for No. 2 M. G. Monon farm next to the Dr. C. T. Dodd farm on which it brought in a good producer. The Union Gasoline & Oil Corp. is drilling at 1,890 feet on the H. L. Day farm.

In South Strabane Township, Victor D. Behm and others are drilling at 635 feet on the Lucy Smith farm. The Carnegie Natural Gas Co. is down 716 feet on the S. W. Balls farm. In North Strabane Township, the Keystone Gas Co. has started drilling No. 2 on the J. H. Hixon farm. In Peters Township, Henderson and others are drilling at 1,565 feet on the Bell heirs farm. William Smith & Co. have reached 1,350 feet on the W. Donaldson farm. R. M. Duden and others are down 400 feet on the No. 2 J. E. Johnson. The Emerald Oil Co. has completed the rig on the Mose Little farm in South Strabane Township.

In Lawrence County, the Carnegie Natural Gas Co. lost the 13-inch bit in starting the deep test on the W. A. Currie farm in South Shenango farm and was unable to recover it and skidded the rig to a new location about 20 feet.

In Beaver County, the test of A. J. Wise, Jr., and others on the Beaver Falls Airport in South Beaver Township is drilling 122 feet in the Corniferous Lime. John T. Galey and others have reached 4,550 feet in the test on the Minnie Weigle (Duff) farm after recovering the lost tools. Drilling is now progressing slowly due to the necessity to cement on account of caving.

In Washington County, Norwood Johnston and others are now drilling by the tools lost at 6,171 feet due to a gas blowout in the test on the James McBurney farm in Mount Pleasant Township. The lost tools are expected to be recovered.

In Westmoreland County, the test of the Potter Development Co. on the Indiana Savings Bank lease (Kern Dodge No. 1) in Fairfield Township is drilling at 7,610 feet. This hole has started to cave near bottom and it is being cemented every 15-foot run.

WEST VIRGINIA

There were several small oil wells completed in West Virginia. In Ritchie County, McBurney and others completed No. 3 M. B. Nutter in Clay district and it is good for 15 bbls. a day from the Maxton sand at 1,612 feet. In Murphy district, Frymeir & Co. deepened No. 5 on the George W. Hammer farm to 2,082 feet, the Squaw sand, and it is good for 2 bbls. a day.

In Calhoun County, the Richter Oil Co. completed No. 3 on the J. L. Elliott heirs farm in Sheridan district in the Salt sand at a depth of 1,786 feet. It is a 4-bbl. producer.

In Marion County, Victor E. Tennant deepened No. 1 Price heirs in Lincoln district to 2,876 feet, the Fifth sand, and lost two strings of tools. It was filled back to the Injun sand and is producing 3 or 4 bbls. a day.

In Tyler County, W. H. Miller completed a 2-bbl. well on the Kate Headley farm in Meade district in Injun sand at 1,875 feet.

Gas Wells

In Cabell County, the West Virginia Gas Co. completed a 335,000-foot gas well on the John J. Porter heirs farm in McComas district at 3,412 feet; Brown shale, 3,070-3,400 feet, with gas at 3,358-65 feet.

In Calhoun County, the Hope Natural Gas Co. completed No. 7,768 Clay McDonald farm in Sherman district at 2,123 feet as a gas well gauging 404,000 feet a day. The Big Injun sand was at 2,010-86 feet, with the gas at 2,020-25 feet and again at 2,056-77 feet. Jeff Miller and others test on the Bert Wears farm in Washington district was completed in the Injun sand, total depth 2,206 feet. It is a gas well gauging 1,660,000 feet a day.

In Clay County, Harry M. Boggs drilled a test on his own property in Otter district to 1,015 feet and has a small gas well. First Salt sand was at 968-1,003 feet; the Second Salt sand at 1,007-15 feet.

In Fayette County, Godfrey L. Cabot, Inc., completed No. 9 Kanawha Gauley Coal Co., in Falls district, at 2,775 feet and it is a gas well gauging 64,000 feet a day.

In Lincoln County, the United Fuel Gas Co. completed No. 4,713 Robert Linville heirs farm, Jefferson district, at 3,853 feet. Gas at 2,365-70 feet; volume, 94,080 feet a day.

In Marshall County, the Manufacturers Light & Heat Co. completed a test on the D. L. McGinnis farm in Cameron district as a gas well gauging 1,500,000 feet a day. It had 50,000 feet of gas at 1,766 feet; the Big Injun sand was at 1,875 feet, with big gas at 1,944 feet.

In Ritchie County, the S. P. Y. Oil Co. completed a gasser on the W. B. and Cora Phillips farm in Grant district in Berea sand at 2,029 feet and it is gauging 142,560 feet a day. In Clay district Mahone and others test on the Thomas Murray farm in the Squaw sand at 1,730 feet is a gas well in the Keener sand 1,730 feet, good for 53,136 feet a day.

In Roane County, L. C. Young and others on the Kee and Lawson farm in Harper district drilled to 1,488 feet, Salt sand, and have a well good for 3,500,000 feet a day. Salt sand was topped at 1,447 feet with gas at 1,466-88 feet.

In Wetzel County, the test of C. B. Lewis and others on the Veronica Doppler farm in Proctor district was shot and increased its gauge from the reported 79,000 feet a day to 3,000,000 feet a day.

Oriskany Field

Four wells were completed in the Oriskany field in Kanawha County. In Elk district, the Glenn Oil & Gas Co. completed the second test on the Virginia Joint Stock Land Bank lease in the Oriskany sand and it is good for 11,000,000 feet a day.

In this district, Benedum & Trees completed the test on the T. W. Walls farm at 4,899 feet and it is gauging 5,275,000 feet a day with a shut-in pressure of 1,520 pounds. Here the Columbian Carbon Co. completed No. 2 W. L. Burdette at 4,929 feet and it gauges 2,700,000 feet a day. The top of the Oriskany sand was 4,894 feet.

In Poca district, the Columbian Carbon Co. test on the B. R. Reed farm at 5,083 feet found Oriskany sand at 4,890-5,048 feet. The gauge after a heavy shot was 5,950,000 feet a day.

Columbian Carbon Co. made a location on the Mary C. Young farm about 2,200 feet west of the gas well on the C. C. Fisher farm in Elk district. The Cameron Oil & Gas Co. made a location test on the Mose Pushkin farm 3,500 feet northwest of the dry hole on the J. C. Jordon farm, in Elk district.

Thirty two wells are actively drilling in the Oriskany field in Elk, Poca, Union and Malden districts and seven rigs are building. Sixteen other locations have been filed. Additional wells should reach the sand this week.

Outside Deep Tests

In Big Sandy district, Kanawha County, the test of the United Carbon Co. on the J. A. and M. F. Osborne farm is drilling at 3,500 feet. The United Fuel Gas Co. is rigging up to deepen No. 4,095 on the Sunday Creek Coal & Land Co. tract, Cabin Creek district.

In Calhoun County, Godfrey L. Cabot, Inc., reached 6,225 feet in the test on the Allen Hardman farm in Center district with no change in the status of the well, a dry hole. This is 34 feet in the Oriskany sand. The line snapped and there is 6,000 feet of cable in the hole.

In Wirt County, the Carnegie Natural Gas Co. has reached 3,900 feet in the test on the W. C. Patterson farm on the Burning Springs anticline in Burning Springs district. In this district, Godfrey L. Cabot, Inc., is still fishing the tools lost at 5,370 feet in the test on the Walter Huffman farm.

In Hancock County, Jonn T. Galey is ready to plug the Rachel Talbott No. 1 in Grant district at a final depth of 5,015 feet. The top of the Oriskany sand was 4,956½ feet and the bottom 4,989 feet.

The best completion for the week in Southeast Ohio was that of the Edward H. Everett Co. and others on the Ella C. Gill farm in Licking County in the No. 2 on this farm. It was completed in the Clinton sand at a depth of 2,971 feet and produced 125 bbls. the first day after shot.

Southwest Texas District

By
GEORGE WEBER

NEW POOL LOOMS IN NUECES COUNTY; TESTS INCREASING

HOUSTON, Tex., May 21.—Discovery of a possible new field in Nueces County, extension of fields in the Lower Coastal and Laredo districts, and increased exploration throughout Southwest Texas, featured the developments of the past week. Field operations showed some increase, and a number of wildcats are drilling in interesting sections. Two deep tests are drilling below 10,000 feet, one in the Balcones fault zone and the other in the Lower Rio Grande Valley sector.

What may prove to be Nueces County's tenth pool was indicated early in the week when the Seaboard Oil Corp. cored an oil sand at 4,319-39 feet in No. 1 James P. Luby. The wildcat made a drill-stem test of the formation, which showed 250 feet of pipe line oil at a working pressure of 125 pounds in 10 minutes. The crude is averaging 51.7 degrees in gravity. Located in southern Nueces County, southeast of the Clara Driscoll and South Clara Driscoll pools, and southwest of the London and Chapman Ranch fields, the showing in the wildcat came as a surprise to many geologists who had considered the immediate area without prospect.

The company, which has had a part in the discovery of two other newly opened fields in the area, South Clara Driscoll and Chapman Ranch, is drilling ahead on No. 1 Luby, which was below 4,650 feet at latest reports. The show at 4,319 feet, which is considered to be the Catahoula by most geologists, is remarkable in the high gravity of the crude found at that level. Operators plan to explore deeper prospects before plugging back and attempting completion of the test in the 4,300-foot horizon. Four miles to the south, the Taylor Petroleum Co. No. 1 Styles, located 8 miles east of Bishop, is coring below 4,500 feet.

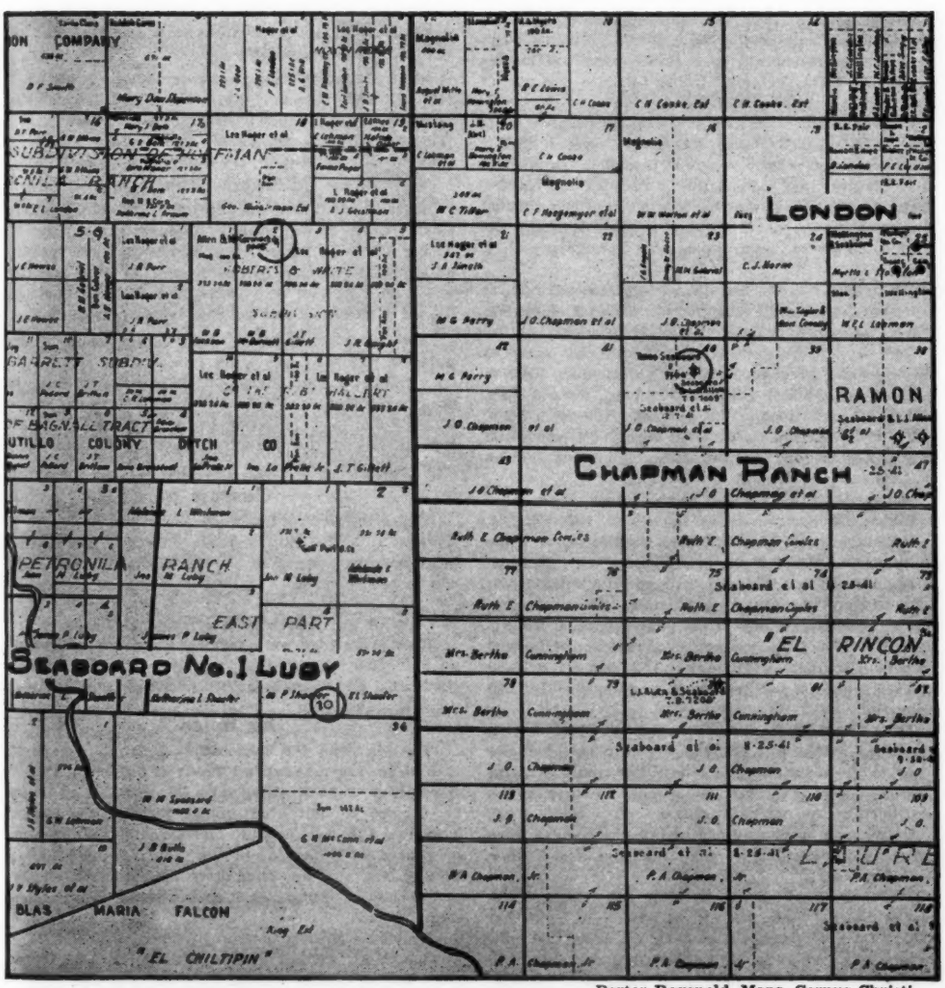
Other Nueces Wildcats Active

Elsewhere in Nueces County five other wildcats are active, or due for immediate spudding, making the county the busiest wildcatting area in Southwest Texas. Three miles north of Agua Dulce, and 1½ miles northeast of the King gas area, Southern Minerals Corp. is again drilling No. 1 King. The wildcat encountered high pressures at 6,515 feet and while killing the well to prevent a blowout, the drill stem was stuck in the hole. No. 1 King, Southern Minerals Corp.'s first wildcatting venture, has had other shows during its drilling.

Two very interesting tests are getting under way across the Cayo del Oso from the Flour Bluff field in southeastern Nueces County, and 2½ miles southeast of the town of Calallen, Phillips Petroleum Co. is drilling below 5,200 feet on a workover, deepening the former Cox No. 1 Harney.

In the Agua Dulce field of the same county, United Producers Co. will attempt completion this week-end of No. 1 Harvey. The test two weeks ago made high-gravity oil and salt water through perforations at 7,375-84 feet. Perforations were cemented and the casing will be reperforated this week at the same level. The salt water encroachment was believed due to a faulty cement job. If successful in bringing in a well, United will chalk up a deep discovery for the county in what is considered to be Vicksburg horizon.

The No. 1 Harvey was carried to a total depth of 9,003 feet, deepest test yet drilled in the county. Casing was set at 7,457 feet prior to testing the horizon.



Porter Regenold, Maps, Corpus Christi

Possible opener of Nueces County's tenth oil field is Seaboard Oil Corp. No. 1 Luby, a wildcat on the Petronilla ranch. No. 1 Luby tested 250 feet of oil at 4,319-39 feet but is being carried deeper in search of other possible producing horizons

Seven New Saxet Wells

Saxet gained seven new producers with new wells distributed as follows: two from the deep 6,700-foot sand, two from the 5,800-foot Frio, and three from the 4,400-foot Clarkwood. A considerable northward extension of the 6,700-foot sand is indicated from results on a drill-stem test made at 6,727-32 feet by the Houston Oil Co. in No. 9 McGregor. The test, in Survey 582, recovered 550 feet of oil in 15 minutes at a working pressure of 250 pounds with one-quarter inch bottom and three-eighths inch top chokes. The oil tested had a gravity of 41.

In Kleberg County small production was brought in in the Kingsville field when Humble Oil & Refining Co. No. 9 Kleberg was completed for 25 bbls. per day at 3,235 feet.

Batesville Field

The new discovery in Zavalla County, which has been named the Batesville field by the South Texas Geological Society, is attracting considerable attention, and much activity is in prospect, according to reports. Wilcox Oil & Gas Co. No. 1 Gilliam, discovery well of the field, is shut in, pending the completion of sufficient storage to care for the production. Rated the outstanding recent discovery in the fault line zone, the new Batesville field is seeing an active leasing campaign with rumors circulating of large blocks changing hands.

To the east, in the Pearsall field of Frio County, the deepest test in Southwest Texas is making hole. Amerada Petroleum Corp. No. 8 Halff & Oppenheimer is below 10,600 feet. Another deep test is being drilled in Willacy County, in the southern tip of Texas. The Shell Petroleum Corp. No. 1 Yturria, discovery well of the La Sal Vieja field, and now being deepened, is coring shale below 10,013 feet.

To the south of this Lower Rio Grande Valley test, another deep wildcat is scheduled to begin. It is Ruez-Morton No. 1 United Land Irrigation Co. in Lot 7, Block 402, of the El Jardin Subdivision, the southernmost wildcat in the United States.

Laredo District

The Laredo district, with exception of the North Sweden field of Duval County, was void of important events. In North Sweden, however, important extensions are being made to the new pool, and a number of new locations staked presage continued development.

(Continued on Page 158)

Michigan Field Report

By
PAUL A. ELLIOTT

NEW ALLEGAN COUNTY WELL FLOWS 1,000 BARRELS DAILY

MUSKEGON, Mich., May 31.—Even the big Buckeye Township, Gladwin County, pool was forced to share a little of the limelight with the new Salem Township, Allegan County pool, of western Michigan last week when the Muskegon Oil Corp., discoverer of the Muskegon field in 1927, Saturday reopened the No. 2 W. Moomey, NW NE SE section 17-4n-13w, as the largest Upper Traverse well ever completed in that section of Michigan.

Larger than any Upper Traverse wells completed in the state except several temporarily completed in the formation more shallow than the Dundee, chief Michigan producing stratum, in the Ogemaw County field several years ago, the No. 2 Moomey Saturday morning flowed 600 bbls. in 14 hours, and was still going strong at the rate of more than 1,000 bbls. a day.

Traverse gas was first found at 1,591 feet; first oil at 1,597 feet, with big oil and gas from 1,609 feet to 1,615 feet, earlier in the week. It then flowed about 100 bbls., naturally. The larger flow, greatest of six wells now completed in the field, started off at the rate of 60 bbls. the first two hours after acid treatment, then dropped to 55 bbls. and finally to average 43 bbls. an hour for the first 14 hours.

The well is located in the proved area, now covering about 1,000 acres in Salem Township, where half a dozen other tests are under way with two or three scheduled to complete this week.

Lentz and Miller, Inc., who opened the Allegan field, also reported No. 1 Hardy, C N half NE NW section 21, Salem Township, started flowing Friday at the rate of 40 bbls. an hour giving it an estimated daily output of 500 or possibly 600 bbls. a day, also from the Upper Traverse.

Gladwin County

The outstanding development in the Buckeye area was the report of a flow of 81 bbls. the first hour after acid from the Bell & Marks No. 1 Wineman, NW SW NW section 9-17n-1e, an outpost in Billings Township. However, no actual or estimated daily production was available up to this writing so it was impossible definitely to determine its significance.

In the same vicinity, south of the Oard-Buckeye, or southeast sector of the major Gladwin pool, T. F. Caldwell, Inc., and Max Pray recorded a flow of 960 bbls. a day from No. 1 Flynn, SW SW NW section 4, also in Billings Township, which made 215 bbls. in the first five hours.

As a result of this, and the Wineman, located a mile directly south, Gordon Oil Co. has started two offsets, one south and the other west, and the Elzie S. Beaver, Trustee, a southwest offset to the Flynn in section 4.

Southeast Buckeye

Though the major portion of Michigan's new initial for the past week again was developed in the northeast sector of the Buckeye pool, one of the largest wells in the Oard sector was completed by Clark & Johnson when the No. 3 G. McMahon was prorated at 1,560 bbls. a day from the Dundee. Limestone was topped at 3,487 feet and the well drilled to 3,590 feet, total depth. Located on the southeast edge of the pool, it flowed 65 bbls. an hour naturally and, with deepening to 87 feet in the Dundee, made 80 to 100 bbls. hourly for the official gauge of 1,560 bbls. per day.

Same operators' No. 2 McMahon was completing in the Dundee but had not yet been officially gauged.

Also in the southeast sector, C. L. Maguire, Inc., completed the No. 1 Fritzwater, SE SE NE section 26 for 35 bbls. a day after long treatment with acid.

Also in the southeast area, the Elzie K. Beaver, Trustee No. 4 Upton, previously estimated good for 370 bbls. a day, was given a final rating of 475 bbls. a day, an increase of 105 bbls. over the previous week.

Another outpost, Sun Oil Co. No. 2 Hines, NW SW NW section 31-17n-1w, in Tobacco Township, was completed at 27 bbls. a day, an increase of 9 bbls. over last week's report of 18 bbls. initial. It made 36 bbls. in seven hours, while in the process of completion, and the second day produced 50 bbls.

Northeast Buckeye

Despite a 50 per cent reduction in the basic exemption for Buckeye wells under proration, from a scale of 300 bbls. plus 10 per cent to 150 bbls. plus 10 per cent, the Wicklund-Buckeye, or northeast sector of Michigan's largest producing area just now continued its upward trend with 11 completions making combined initial last week of nearly 9,000 bbls.

Though only one of the new wells exceeded 1,000 bbls. a day, an average of more than 800 bbls. was maintained. The largest new well, two locations east and one south of the Wicklund discovery well, was the Double K Trust No. 1-B State, NW NE NE section 14, which won a rating of 1,750 bbls. natural initial flow.

The Wicklund No. 2-B State, approached 1,000 bbls. when it made 960 bbls. from the Dundee topped at 3,524 feet and drilled to 3,630 feet, located in SE SW NE section 11, also in the proved territory.

The Northeast pool was extended to the east when the Smith Petroleum Co. No. 1 Reed, SW SE NE section 11, made 900 bbls. daily, naturally, from the Dundee, topped at 3,541 feet and drilled to 3,625 feet. After prorated, it was listed at 735 bbls. a day.

To the northeast, Socony-Vacuum Oil Co., Inc., completed the No. 1 L. Dailey, SW SE NW section 12, for 480 bbls. a day after acidizing at a total depth of 3,636 feet. In the same section, the J. V. Wicklund No. 2-C State, SE SW NW, flowed 700 bbls. a day after acidizing. Limestone was first encountered at 3,562 feet, and the well rated at 362 bbls. on a later 24-hour proration gauge.

Rex Oil & Gas Co. had drilled into pay, but not yet determined the initial rating of No. 1 J. McKinney, SW SW NE section 13, a quarter-mile extension.

Sun Oil Co. also extended the northeast sector to the westward by completing No. 1 Ockerman, SE NW SE section 10, for an initial of 615 bbls., natural flow, at 3,649 feet, 90 feet in the Dundee. Sun No. 6 Salla, NW SW SW section 11, made 78 bbls. in 12 hours, and was estimated good for 350 bbls., topping the Dundee at 3,539 feet and drilling to 3,629 feet.

Smith Petroleum Co. also completed two companion wells on the Brenner lease, the No. 1, NW SE NW section 14, making 150 bbls. daily, natural flow, while No. 2 flowed 600 bbls, naturally. Both were finished in Dundee at 3,642 feet. No. 2 topped the limestone at 3,555 feet and No. 1 at approximately the same point.

On the northern edge of the pool, Wicklund No. 1-D State, NW NW NE section 11, was rated good for 700 bbls. a day topping the Dundee at 3,563 feet and drilling to 3,625 feet. An acid treatment was made with 1,000 gallons of fluid.

Daily Crude Oil Co. No. 2 Jakab, NW SW NE section 10, topped Dundee at 3,572 feet, drilled to 3,656 feet and was rated good for 324 bbls. a day after treatment with 1,000 gallons of acid. It added another 10 acres on the west edge of the northeast sector.

Three tests previously drilled into the Dundee were increased considerably by acid treatment and further work last week.

Mammoth Producing & Refining Corp. boosted the flow of No. 1-C State, NE SE SE section 10, from 200 bbls. to 720 bbls. daily. Buckwin Oil Co. added 160 bbls. to the estimated initial of 1,400 bbls. a day from No. 4 State, NE NW SE section 11, at 3,627 feet. Dundee was first encountered at 3,555 feet.

After several weeks of testing, the Orr No. 1 Flandorfer, SE SE NW section 2, was given a daily rating of 15 bbls. on the north edge of the Wicklund pool.

Sun Oil Co. got into difficulty in the No. 1 Raab, NE SE NE section 10, which two weeks ago made 929 bbls. initially, being forced to pull the tools and fill back from 3,620 feet to 3,612 feet.

Sherman—Isabella

Three new wells extended the Sherman Township, Isabella field, to the south and added 821 bbls. of new initial, while another was increased 110 bbls. in daily flow.

Pure Oil Co. completed two tests, No. 3 Latham, N half SE SE section 33-15n-6w, making 421 bbls. natural flow, one of the largest recent completions in the area. Drilling was suspended at 3,678 feet as operators planned to treat with 250 gallons of acid.

Pure's No. 1 Latham heirs, NE SE SE section 32, same township, started at 100 bbls. a day, topping the Monroe at 3,646 feet and drilling in 4 feet to 3,650 feet, where it will be tubed and treated.

Rowmor Corp. No. 2 Leiter, SE NE SW section 33, started at 300 bbls. a day after acid treatment. It settled to 260 bbls.

Pure's No. 2 Latham, NW NW SE section 33, which was rated at 90 bbls., initially, was boosted to 200 bbls. a day by acidizing. Monroe was topped at 3,689 feet and drilling completed at 3,693 feet.

Gulf Refining Co. finished a dry hole in No. 1 Koch, NW NE NW section 1-13n-4w, a Lincoln Township, Isabella County, wildcat at 3,735 feet, where it was flooded with bottom water.

Midland County

Merchants Oil & Gas Co. completed the larger of two small Dundee oil producers in Midland County, namely: The No. 1 Iosco Land Co., E half W half NW section 16-14n-2w, Greendale Township, for 150 bbls., initially, based on a flow of 80 bbls. in 12 hours. Dundee was topped at 3,520 feet and the hole drilled to 3,590 feet.

Two completions were added in the Jasper Township, or Yost area, one a dry hole and the other a 30-bbl. well from the Dundee. The former was Pure Oil Co. No. 1-A Kneeland, N half NW SE section 11-13n-2w, at 3,483 feet, and the latter, the Pure No. 8-C Bond, N half SE NW section 12, which swabbed 30 bbls. in 24 hours at 3,438 feet.

Gassers

Wolverine Natural Gas Corp. No. 1 Forgar, center of sections 1, 2, 11 and 12, made 7,000,000 feet in the Michigan Stray sands in the Tri-Townships pool, but was to be deepened.

Ogemaw

Ross & Bernier were making a small producer of an extension well in Ogemaw Township and county, the No. 3 J. and K. Isworski, SE NE NE section 23-22n-1e.

Dry Holes

The Michigan Oil Exploration Co., in a deep test drilling for several years on the Groff property, NE SW NW section 35-7n-9w, Vergennes Township, Kent County, decided to quit after failure through the Berea, Traverse, Dundee, Monroe, and through the Trenton at nearly 6,000 feet deep. An Ada Township, Kent County test, also was shut down at 2,454 feet, on top of the Dundee, into which it was expected to be drilled soon.

Wolverine Drillers temporarily abandoned the No. 1 Gardulski, SE SW SE section 19-2s-9e, Nankin Township, Wayne County wildcat, at about 300 feet.

Two other Wayne County wildcats reported light shows in the Trenton, the Penchartrain Petroleum Corp. No. 1 Boynton, Sumpter Township, and the Huron No. 1 Scheffling, in Van Buren Township.

Central West

By STAFF CORRESPONDENT

PURE'S NO. 1 TRAVIS MAKES 2,643 BARRELS IN 24 HOURS

MATTOON, Ill., May 31.—Pure Oil Co. unquestionably has a good well in No. 1 Travis, SW NW section 33-3n-8e, Clay County, Illinois. Following its 1,200-bbl. production in 10 hours, reported last week, the well made a 24-hour production of 2,643 bbls. of oil and 1,300,000 feet of gas through 2½-inch tubing which had been run to 2,956 feet, total depth of the hole is 2,968 feet. It is producing from McCloskey sand, one of the big producing formations found in the old southeastern Illinois fields.

Adams Louisiana Oil Co. and associates completed two wells in the Patoka pool in Marion County. No. 4 Merryman, CEL SE SW section 21-4n-1e, was shot with 10 quarts at 1,412-21 feet, Benoist sand, and it made a 30-bbl. pumper. No. 5 Merryman, SE SW SW section 21-4n-1e, topped Stein sand at 1,289 feet and had Benoist sand at 1,392-1,413 feet. The well started at 60 bbls. a day on the pump. It was not shot.

Pure Oil Co. was still trying to make a well out of No. 1 Stella Billington, SE SE NE section 27-1n-7e, in Wayne County, without drilling deeper. It is at a total depth of 3,131 feet. It was recemented at 2,943 feet. The 2½-inch tubing was being pulled preparatory to a cleaning-out job. There is a showing of oil in the hole.

Drilling operations covered in the past week follow:

Marion County

In Marion County, Hempen & Burgess were underreaming 8-inch casing to 1,060 feet in No. 1 E. Allison, NW cor. NE NW SW section 33-4n-3e. Schlassberg & Sigel have spudded No. 1 in SW cor. SE SW section 20-2n-3e. Hempen & Burgess set 10-inch pipe at 887 feet in No. 1 Jolliff, NE NW SE section 28-4n-1e. It had a hole full of water at 750 feet. Same firm was drilling at 890 feet in No. 1 Jeff Smith, NW NW SE section 28-4n-1e. The Adams Louisiana Oil Co. was below 1,390 feet in No. 1 Anna L. Davidson, SW SW SE section 21-4n-1e. Baldwin & Parker were drilling below 2,050 feet in No. 1 Nichols, CEL SW SE section 12-4n-1e (corrected location). Illinois National Oil Co. was shut down at 1,020 feet, waiting for a cable, at No. 1 City Lot, city of Patoka, NE cor. SW section 29-4n-1e. Adams Louisiana Oil Co. No. 1 Sam Pugh, NW NW section 29-4n-1e, took a core at 1,568-75 feet, which was partly saturated, and drilled to 1,585 feet where it shut down. Wiser Oil Co. was lowering 8-inch casing to 1,320 feet in No. 1 Seth Martin, NW SE NW section 27-4n-1e. Adams Oil & Gas Co. made a location for No. 2 Anna L. Davidson, SW cor. SW SE section 21-4n-1e. Brown and others were rigging up machine for No. 1 Brockman, NW cor. SE section 22-4n-1e.

Bond County

Whitehead & Morey No. 1 Polland, NW SE SW section 26-6n-2w, Bond County, was drilling at 264 feet.

Christian County

Parshall & Graham were moving in material for a 3,000-foot test, No. 1 York, SW SW NE section 36-15n-2w, in Christian County.

Clark County

National Consumers Oil Co. No. 1 Minnie Jackson, NW NE NW section 21-11n-12w, Clark County, set 8-inch pipe at 1,362 feet and was cleaning out.

Clay County

Pure Oil Co. was moving in rotary to start No. 1 Sarah Bechtel, NE SE NW section 33-3n-8e, in Clay County, and building derrick for a rotary test for No. 1 B. W. Mosely, NW NE NE section 4-2n-8e.

Clinton County

Santa Fe Oil Co. was drilling below 685 feet in No. 1 Robbin, SE cor. SW SW section 5-1n-3w, Clinton County, and Timberlake and others were below 875 feet in drilling No. 1 Bergman, SE NW SW section 8-1n-3w. Ohio Oil Co. was still shut down at 1,084 feet in No. 3 Trane, SW NE NW section 8-1n-3w.

Effingham County

In Effingham County, W. H. Hazlett set 6⅝-inch casing at 2,025 feet and was drilling below 2,080 feet in No. 1 Haasman, NE cor. section 5-7n-6e.

Wayne County

Lebove and others made a location for No. 1 McNeely, NW NW NE section 11-1s-7e, Wayne County. Pure Oil Co., in its No. 1 Brach, NW SW SW section 26-1n-7e, took a core at 2,880-94 feet, set 7-inch casing at 2,936 feet and was drilling below 2,937 feet.

Jefferson County

In Jefferson County, Dee & Carter No. 1 Harvey Hamilton, NE cor. SW NW section 20-4s-3e, was at a total depth of 2,725 feet and will move in standard tools to finish.

Perry County

J. H. Forrester's deep test in Perry County, No. 1 fee, C W half SW NW section 5-6s-1w, was drilling at 4,915 feet.

Lawrence County

Warren Hastings No. 1 Christensen, SE cor. SW SW section 11-3n-12w, had a 20-bbl. showing in McCloskey sand. A core was taken at 1,785½-95 feet. The recovered section was of Oolitic lime with low saturation. Six-inch casing was set at 1,721 feet and the hole was drilling at 1,795 feet.

On the Indiana Side

In Vigo County, Indiana, the first county to be subjected to tests in the new drilling campaign in the basin, Hoffmeister, Ring and others were below 1,125 feet in No. 1 Earl French, NE cor. SE NE SE section 26-10-9w. Mississippi lime was topped at 921 feet. A 2,500,000-foot gas production was found at 355-61 feet. Keller Development Co. was drilling below 1,500 feet in No. 1 Ben Beard, CWL NE SE section 33-11n-8w. Eight and one-quarter inch casing was set at 610 feet.

OHIO DEVELOPMENTS

FINDLAY, Ohio, May 31.—There were no outstanding developments in the Ohio field this past week but many new locations have been staked in this district and activity continues to increase. A slight increase in operations was apparent in the Lima field and some interest has been shown in the three new tests in Henry County. Norman L. Stevens is drilling on the Jackson farm, section 36, Harrison Township, and on the Sampsel farm in section 36, same township. The Jackson well is an east offset to the Nagel well, recently completed as a 10-bbl. producer. Same operator is moving a rig onto the Wells farm, in the same section. In section 24, Harrison Township, E. S. Raydure has moved in a rig for a test to the Trenton sand.

In Auglaize County, section 3, Logan Township, the Buckland Oil Corp. abandoned No. 5 S. V. Scott as a failure. It was drilled through Trenton sand at 1,165-1,215 feet.

In Ottawa County, section 36, Clay Township, Packer Creek Oil Corp. is rigged up on the E. F. Strohscher property.

In Seneca County, section 35, Liberty Township, J. R. Summers' test on the J. F. Summers property was completed as a 1-bbl. well in Trenton sand. In section 24, same township, Charles Zeising No. 1 Laura Wright made 2,000 feet of gas from the same formation. In section 19, Pleasant Township, A. H. Russell & Co. are drilling on the Clara Smith property.

W. J. Dempsey & Co. are drilling on the Chester Roberts property in section 4, Jackson Township, Sandusky County.

In Mercer County, section 30, Butler Township, Jay Producing Corp. is drilling the second test on the C. Ebbing farm and in section 34, Gibson Township, Cole Oil & Gas Co. is completing a test on the L. Lowery property.

In Hocking County, section 22, Ward Township, Preston Oil Co. No. 148 Sunday Creek Coal Co. made a light show of oil and gas in the Clinton sand at 3,430-60 feet. The well was shot with 90 quarts and swabbed 6 bbls. of oil and gauged 11,442 feet of gas the first 24 hours after a shot, but will probably be abandoned. In section 16, Ward Township, Ohio Fuel Gas Co. No. 150, on the same property, was drilled 5 feet into the Berea sand at 928 feet and was completed as a commercial gas well. In section 24, Benton Township, Dowler Oil & Gas Corp. No. 2 J. & D. Earnhart will not be abandoned but will be shot again with 100 quarts. In section 35, Washington Township, Moffat No. 2 Adam Schaal, which made 20,000 feet of gas and a show of oil naturally, is making water and is being abandoned.

In Vinton County, section 29, Brown Township, Kelch Brothers are drilling No. 5 on the Mary Geiger property.

Hall & Henning Co. No. 4 J. W. Pryor, in section 21, Grandview Township, Washington County, was drilled through the Injun sand at 1,636-58 feet without a show of oil or gas and has been abandoned. In section 34, Hall & Hanlon & Co. No. 2 Mary Moore was drilled through the Keener sand at 1,368-1,407 feet, where it gauged 104,000 feet of gas, and into the Injun sand at 1,412 feet, where it made a show of oil at 1,420 feet, and will be drilled a few feet deeper into the sand. In section 34, Ludlow Township, Depuy Brothers No. 4 H. W. Winland was completed below the Injun sand at 1,225-85 feet and at 1,355-70 feet and gauged 231,120 feet of gas naturally. In section 29, Wesley Township, O. K. Parrett No. 7 A. A. Goddard made 4 bbls. of oil from the Maxsburg 300-foot sand at 598-623 feet the first 24 hours after a shot of 40 quarts.

In Monroe County, section 9, Franklin Township, Lumbatis & Co. No. 2 Olive Fogle gauged 893,592 feet of gas in the second Salt sand at 950-65 feet. In section 23, Washington Township, Bentz Syndicate Oil Co. No. 4 B. F. Cline made a show of oil in the Injun sand at 1,460-1,550 feet but was abandoned when a shot of 50 quarts failed to increase the production. In section 10, Center Township, F. S. Paulus has staked a location for No. 6 Mary Ackerman. In section 16, same township, N. T. Stout is spudding No. 3 Alva and Mary Griffith.

In Morgan County, section 11, Union Township, Sands & Co. No. 34 Martha Glass was completed below the first Cow Run sand at 140-159 feet and made 2 bbls. after a shot of 50 pounds of gelatine. The same operators also completed No. 35 on this lease. This well made 2 bbls. after a shot in the same formation at 150-169 feet.

In Guernsey County, section 3, Jefferson Township, Hayes Ferguson & Co. are rigged up for a test on the Luther Kinaison property. In section 15, same township, Ronshousen & Ridgeway are rigged up for No. 4 on the R. C. Gillespie and others property.

East Ohio Gas Co. has completed the test on the C. E. McCafferty lease in section 33, Green Township, Summit County, as a commercial gas well. This test was drilled through the Clinton sand at 4,222-44 feet and gauged 1,332,000 feet of gas after a shot. In sec-

(Continued on Page 152)

East and East Central Texas

By L. E. BREDBERG

FIFTY-SEVEN NEW LOCATIONS STAKED IN EAST TEXAS FIELD

DALLAS, Tex., May 31.—Notwithstanding the recent 8-cent advance in the posted price of East Texas crude reports from the field are that premiums in various forms are still being offered by some independent buyers in an effort to hold connections they had taken away from major companies before the price increase. Spurred on by the tight crude situation in the world's biggest oil field, operators made 57 new locations in the past week. Previously, for some time, the new work had run from 30 to 40 new locations per week. Thirty-six new oil wells were completed in the field in the past week.

The deepest test ever drilled in the East Texas district, Tide Water Associated Oil Co. and Seaboard Oil Co. No. 7 Monning, S. Sanchez Survey, Long Lake field, southwestern Anderson County, appears dry in the Lower Trinity formations, and will probably be plugged back to produce from the Woodbine sand. The last drilling report gave it at 9,975 feet, and by this time it is no doubt at the proposed 10,000-foot depth. The Travis Peak of the Lower Trinity was topped at 9,930 feet. Elevation is 233 feet. The Lower Glen Rose was topped at 8,748 feet.

On the faulted Campbell structure in the northeastern part of Hunt County, along the Mexia-Talco fault, Stanolind Oil & Gas Co. No. 1 J. P. Hawks, in the R. Ragsdale Survey, is not looking good as a deep potential producer as it logged top of the anhydrite at 5,335 feet and was drilling below 5,353 feet. Elevation is 566 feet.

Hopkins Wildcat

Housh and Thompson, of Houston, two of the operators of the group who discovered the Talco field in Titus County last year, have staked location for a wildcat about 5 miles southwest of the Sulphur Bluff field, along the fault, in Hopkins County. It is on the Arthur B. Spencer lands in the G. Lineceum Survey, and contract calls for a 4,800-foot test to be spudded by June 1.

Hughes & Williams No. 1 fee, Agaton Caro Survey, 6 miles southeast of Brashear and about 15 miles southwest of the Sulphur Bluff field, Hopkins County, was abandoned at 4,456 feet.

Dr. J. E. Carpenter is assembling a block near the town of Brashear in Hopkins County, in and around the J. Clark and R. B. Craft Surveys. He is now drilling a wildcat between Brashear and Cumby, the test standing at 3,715 feet at last report.

John G. Mayo of Houston, who started a test on the Mount Enterprise structure in southern Rusk County, which has been taken over by the Barnett Petroleum Corp., has staked location for a second Trinity test in the district. It will be drilled on lands of the Citizens National Bank in the Del Carmel Survey, 2 miles east of Henderson in Rusk County. Al Sutton will drill the test to 6,800 feet, and spud before June 15. Mr. Mayo holds a block of 1,000 acres in the area, on which a geological and geophysical high is supposed to be located. Several major companies have spreads in the area, with scattered leases being held by others in the vicinity of the location.

W. W. Bradley has staked location for a 6,500-foot Trinity test on his 8,000-acre block, 16 miles northeast of Longview, and east of the East Texas field in Gregg County. The location is in the R. Williamson Survey. The block extends into northeastern Rusk and southwestern Harrison counties. A former test on the block only drilled in search of Woodbine sand production and was abandoned at 3,129 feet. It was located in the William Pettus Survey in the southwestern part of Harrison County.

Fannin County Test

George W. Stuck of Chickasha, Okla., is to sink a 4,000-foot wildcat northwest of Honey Grove in the northern part of Fannin County. He holds a block of between 12,000 and 14,000 acres in the area.

Lamar Test

Judge A. W. Walker, of Tyler, and associates have derrick up for a wildcat on the R. L. Rose lands in the A. T. Nowell Survey north of Blossom in Lamar County. The owners hold a block of 4,000 acres in the area. Contract has been let to McGee & Blackburn for a 3,500-foot test.

Ellis County

The Gigantic Oil Co. of Dallas has erected derrick for a test on a block of 28,000 acres in southern Ellis and northern Navarro counties, following a geophysical survey of the area. Location is on the C. H. Sullivan lands in the Wood Survey, 1½ miles south of the town of Rankin. Contract calls for a 4,500-foot test. The block is located about half way between Waxahachie and Corsicana, beginning about 2 miles north of Italy and extending to near the community of Byrd and about 6 miles south of Ennis.

Henderson County Test

R. J. Paschal has staked location on the H. M. Wilson farm, in the Thomas Caro Survey, 4½ miles north of Malakoff in southern Henderson County, for a wildcat test. It will be drilled in search of Trinity production as a Woodbine failure previously drilled on the block, condemns that formation as the potential producing horizon. The Magnolia Petroleum Co. holds considerable acreage around the test.

J. W. Shipman and others have contracted to deepen an old test on lands of the Citizens Bank in the J. J. Barbo Survey, 4 miles northeast of Henderson in Rusk County. Several major companies have been purchasing leases in that area on the strength of the test, which will probably go to the Trinity.

Cherokee County

The Stoco Oil Co. (J. M. Burhnam) No. 1 Parks, in the J. T. Cook Survey, 1½ miles northeast of the Rusk pool, has been shut down at 5,067 feet to put on a control head requested by the Railroad Commission, after the test cored some sand showing oil at 5,060-67 feet. The base of the Austin Chalk was logged at 5,055 feet. Elevation is 417 feet.

East Texas field locations took another jump this week, increasing to 57, whereas they have been running between 30 and 40 each week, while this week 39 tests were completed, 36 of which were producers. Fourteen wells were completed in the Talco field, one of the heaviest weeks for this field from a completion standpoint. There are now 36 tests under way in the Talco field.

EAST CENTRAL TEXAS COMPLETIONS

Anderson County

American Liberty Oil Co. and others No. 1 G. E. Gauge, near Blackfoot, dry and abandoned 9,205 feet, elevation 384 feet. Tide Water Associated and others No. 1 Smith, 5,306 feet, 3 bbls. distillate in two hours through five-thirty-seconds inch choke.

Angelina County

Plaza Oil Co. No. 2 Martin Wagon Works, 1,474 feet, 7 bbls. per week. Welch-Sandler No. 2 Collins, 1,463 feet, 7 bbls. per week swabbing.

Franklin County

W. B. Hinton No. 3 Owings, 4,320 feet, 306 bbls. on pump. Humble Oil & Refining Co. No. 1 Truitt, 4,315 feet, plugged back to 4,280 feet, 780 bbls. on pump. Stroube and Stroube No. 1 Hedrick, 4,290 feet, 10 bbls. per day on pump. Texas Co. No. 1 H. C. Barker, 4,277 feet, 9 bbls. per hour, flowing.

Hopkins County

W. L. Goldston No. 8 Smith, 4,518 feet, 40 bbls. per hour. Hager and Luce No. 2 Pierce, 4,543 feet, 598 bbls. through one-quarter inch choke. Hughes and Williams No. 1 fee, 4,456 feet, dry and abandoned.

Titus County

J. Harrell and Burnett No. 1 J. G. Barber, 4,355 feet, 288 bbls., 4 per cent water, on pump. W. B. Hinton No. 4 Coker, 4,240 feet, 423 bbls. on pump. Housh and Thompson No. 2 Blackburn, 4,325 feet, 502 bbls. on pump. Magnolia Petroleum Co. No. 2 Batson, 4,310 feet, 292 bbls. through one-quarter inch choke. Randy Moore Trust No. 2 Moore, 4,310 feet, 585 bbls. on pump. John O'Neal and others No. 2 Edwards, 4,310 feet, 268 bbls. on pump. Y. Rogers No. 1 Kelley, 4,300 feet, 220 bbls. on pump. Tide Water Associated No. 1 Carr, 4,282 feet, 308 bbls. on pump. Tysco Oil Co. No. 1 Edwards, 4,280 feet, 360 bbls. in 22 hours on pump. Yost Oil Co. No. 1 Methodist Church, 4,303 feet, 344 bbls. on pump.

EAST TEXAS COMPLETIONS

Gregg County

American Petroleum Corp. No. 15 Hearne, 3,521-34 feet, 48 bbls. per hour; No. 17 Hearne, 3,491-3,508 feet, 52 bbls. per hour. Brista and others No. 7 Moore, 3,507-32 feet, 15 bbls. in 20 minutes. Faith Oil Co. No. 20 Barrett, 3,672-96 feet, 20 bbls. in 30 minutes. L. G. & S. Oil Co. No. 1-C McQueen, 3,564-75 feet, 45 bbls. per hour. J. Long Drilling Co. No. 1 Hamby, 3,586-3,618 feet, dry and abandoned. Magnolia Petroleum Co. No. 9 Tuttle, 3,520-30 feet, 88 bbls. per hour. Stanolind Oil & Gas Co. No. 56-B McKinley, 3,591-3,621 feet, 52 bbls. per hour. Tide Water Associated No. 28 Castleberry, 3,625-41 feet, 5 bbls. in 10 minutes; No. 15 Moore, 3,514-51 feet, 14 bbls. in 10 minutes. Delta Drilling Co. No. 3 Alexander, 3,520-28 feet, 5 bbls. in 30 minutes. Empire Oil & Refining Co. No. 12 Walker, 3,650-89 feet, 39 bbls. per hour. Hamilton and others No. 5 Utzman, 3,491-3,510 feet, 40 bbls. in four hours; No. 6-A Utzman, 3,508-51 feet, 20 bbls. in 40 minutes, on pump. Henry Oil Co. No. 7 Laird, 3,545-62 feet, 20 bbls. in 15 minutes. Humble Oil & Refining Co. No. 25 Knowles, 3,545-3,622 feet, 40 bbls. per hour. McCullough and others No. 3 Elder, 3,524-91 feet, 150 bbls. in 15 hours on swab. Potter Brothers No. 2 Gelber, 3,492-3,500 feet, 36 bbls. per hour. Sun Oil Co. No. 11 Smith, 3,603-19 feet, 56 bbls. per hour. Tide Water Associated No. 31 Barton, 3,598-3,615 feet, 7 bbls. in five minutes.

Rusk County

Gulf Oil Corp. No. 11 Baton, 3,596-3,696 feet, 4 bbls. per hour on swab. Humble Oil & Refining Co. No. 10-A Sexton, 3,662-3,724 feet, 70 bbls. per hour. Overton Refining Co. No. 1 Barker, 3,686 feet, 20 bbls. per day on pump, 90 per cent water. Wheelock & Collins No. 18 Wells, 3,693-3,715 feet, 15 bbls. per hour on gas lift. Atlantic Refining Co. No. 21 Fair 3,613-95 feet, 56 bbls. per hour. Gant and others No. 18 Harris, 3,592-3,603 feet, 18 bbls. per hour. Stanolind Oil & Gas Co. No. 28-A Maxwell, 3,778-83 feet, 58 bbls. per hour. Texas-Canadian Oil Co. No. 4 Cox, junked 920 feet. Tide Water Associated No. 7-A Fainney, 3,649-3,701 feet, 10 bbls. in 15 minutes; No. 4 Rollins, 3,635-46 feet, 25 bbls. in 30 minutes.

Smith County

Sutton & Hawkins No. 7 C. M. E. Church & Smith, 3,790-91 feet, 80 bbls. in four hours.

(Continued on Page 158)

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Among Gulf Coast Drilling Contractors

Jordan Drilling Co. extended and opened production from the Conroe sand in the Segno field, southern Polk County, by the completion of Humble Oil & Refining Co. No. 3-B Kirby Lumber Co. Contract was received for a second test and the rig is being moved over. On the Vinton dome in Calcasieu Parish a mile extension was made for the Woodley Petroleum Co. which is expected to result in a revival of drilling activity.

H. J. DeArman has abandoned his No. 1 Tyrell-Garth at 7,029 feet and the diesel rig is being moved out. The wildcat was located on the Cedar Bayou Prospect, Harris County, and was quit at 7,029 feet.

C & C Drilling Co. is rigging up a wildcat test on the Needville Prospect, Fort Bend County, for Marlen Oil Co., and has two rigs operating in the Hastings field for Showers & Moncrief and in the Thompson field for H. M. Naylor.

Contract was received by George Echols from the Fohs Oil Co. for a well offsetting the recently completed Fonda producer along the Rodessa fault trend in Marion County. It is on the McReynolds lease and the rotary rig is being moved in. Two rigs are active for the same company in Louisiana. One is located in the Gillis field while the other is in Lafourche Parish. In the north extension area of the Heyser field, Victoria County, No. 4 Bennett, recently completed for a distillate producer, is being drilled deeper.

Cron & Gracey are making a series of tests on the important wildcat test of Barnsdall Oil Co. No. 1 Edwards, located on the Rockport Prospect in Aransas County. The well showed considerable gas pressure on a drill stem test below 8,000 feet and another test was scheduled to be made. Other operations are reported at the South Houston, Manvel, Dickinson, Flour Bluff and St. Martinsville fields for the Texas Co., Stanolind Oil & Gas Co., Humble Oil & Refining Co. and Tide Water Oil Co.

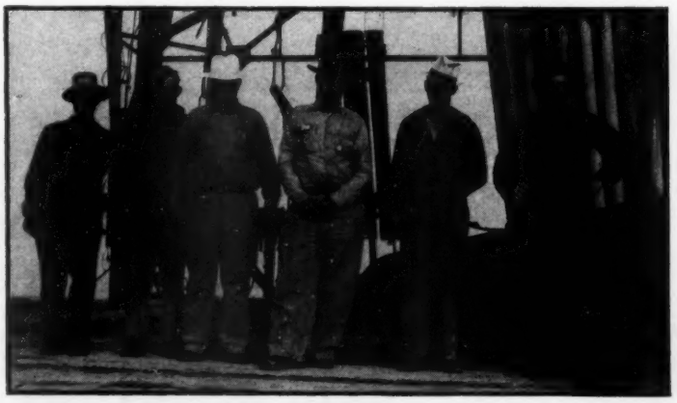
Edwards Drilling Co. completed No. 1 Fite, a north offset to the discovery well of the Sandy Point field, Brazoria County, for a distillate well and has two rotaries running for the Humble Oil & Refining Co. in the Amelia field. Harry L. Edwards completed Ken-Ben Oil Co. test in the south extension area of the Dickinson field and has two tests coring for the sand for the Turman Oil Co. and the Bennet-Kenyon Oil Co.

Loffland Brothers completed No. 1 W. P. McCormick in the West Beaumont field for the Stanolind Oil & Gas Co. and is testing two other wells for the same company.

Glenn H. McCarthy recently purchased a heavy duty rotary rig, which is being moved to the recently discovered Palacios field in Matagorda County where his second test, No. 2 Foley, is coring below 7,800 feet. His No. 5 Longe has been completed for a producer in the West Beaumont field and it has been moved over for No. 6 Longe. To the south, two strings of tools are operating for the Humble Oil & Refining Co.

One of the most important deep tests ever drilled in the East Texas district is being drilled by Smith & McDannald for the Tide Water Oil Co. in the Long Lake field. The well is situated on the Monning lease and has reached a depth of 9,966 feet, at which point a drill stem test was being made. A more thorough test of the Trinity sand is being made which will probably carry the hole below the 10,000-foot horizon. South of Eunice in Acadia Parish, one rig is being moved in for a 9,000-foot test

(Continued on Page 168)



Day tour of Rhodes Drilling Co. at Texas Co. No. 1 Bayou Sale, St. Mary Parish, which was drilled to 12,261 feet, making it next to the deepest hole in the world: Phillbert LeCombe; Donat Simar; G. W. Rhodes, (tool pusher); Sam Mooney, foreman, Texas Co.; G. M. Biggs, driller, and E. O. Robinson

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Rocky Mountain Area

By
T. R. INGRAM

MEDICINE BOW HAS ANOTHER BIG OIL AND GAS PRODUCER

DENVER, Colo., June 1.—There were no completions in Colorado. Two new operations were reported in Moffat County, one in the Iles district and the other at Powder Wash.

The Ohio Oil Co. and California Co. No. 2 Kyle, in the Medicine Bow field, Carbon County, Wyoming, averaged 135 bbls. an hour with 17,000,000 feet of gas per day from the Sundance. Location was made for No. 3-A Kyle. The Salt Creek unitization plan is making progress. The Ohio Oil Co. No. 2 Richards & Comstock, in Lance Creek, made 20 bbls. an hour, naturally, and its No. 2 Putnam made 30 bbls. per hour on drill stem test. The Osage field had one small completion and three new operations.

Sale of leases on 9,960 acres of Indian land west of the Cut Bank field was made to Frank R. Henry. There were no completions in the Cut Bank field and only two new locations. T. P. Kyle will drill his third well on the Bow and Arrow structure in Toole County. Four completions were reported in the Kevin-Sunburst field.

NEW MEXICO

Opening of a new Lea County pool was indicated at Gulf Oil Corp. No. 1 Shahan, C NW NE section 33-25-37, wildcat 2 miles east of lime production and more than 1 mile south of sand wells in the Jal area. After acid treatment it flowed 78 bbls. of oil the first hour and 75 bbls. the second hour, and was shut in for storage. It flowed through 2-inch tubing set at 3,273 feet. Total depth is 3,280 feet in lime. It had not been completed.

Largest of 12 completions in Lea County during the week was Stanolind Oil & Gas Co. No. 29 State, C SW NE section 9-19-38, in the Hobbs area. It was acidized with 2,000, 4,000 and 6,000 gallons and flowed 13,748 bbls. of oil, with 2,217,000 feet of gas, in 24 hours. Top of pay was 4,125 feet; total depth 4,178 feet.

Six wells were completed in the Monument-Eunice area. Stanolind Oil & Gas Co. No. 1 Owen, C SW NW section 3-22-37, topped pay at 3,646 feet, total depth 3,725 feet, and flowed 90 bbls. of oil in four hours through choke.

Amerada Petroleum Corp. No. 1-Z State, C NE NE section 13-20-36, flowed 937 bbls. of oil naturally through choke in 8 hours and 45 minutes from pay topped at 3,778 feet, total depth 3,864 feet.

Gulf Oil Corp. No. 2-G Bell, C SW SE section 13-20-36, topped pay at 3,775 feet, was bottomed at 3,876 feet, acidized and flowed 105 bbls. of oil in five hours through open tubing. Same company's No. 4 White, C SW SE section 25-20-36, had natural flow of 180 bbls. of oil in three hours from pay at 3,752 feet, total depth 3,850 feet. Gas gauged 1,809,000 feet. Same company's No. 1-C Kutter, C SE NE section 18-19-37, had pay at 3,925 feet, was bottomed at 4,026 feet, and flowed 95 bbls. of oil in five hours through choke.

Shell Petroleum Corp. No. 4-K State, C NW NE section 36-20-36, flowed 237 bbls. of oil naturally in four hours, with 2,000,000 feet of gas. Top of pay was 3,730 feet; total depth 3,854 feet.

In the Grizzell area, Ohio Oil Co. No. 1 Grizzell, C SW SE section 5-22-37, was acidized and flowed 140 bbls. of oil in 24 hours. Top of pay was 3,650 feet; total depth 3,740 feet.

Texas Co. No. 1 J. P. Alexander, C Lot 14, section 5-21-37, had pay at 3,705 feet, was bottomed at 3,755 feet, and was flowing from 45 to 50 bbls. of oil daily through tubing.

East of the Cooper pool, Gulf Oil Corp. No. 1 Woolworth, C NE SE section 30-24-37, was completed as a gasser at 3,217 feet, total depth. It gauged 702,000 feet of gas.

Stanolind Oil & Gas Co. No. 4-C Myers, C SE SW section 22-24-37, had pay at 3,455 feet, total depth 3,565 feet, was shot and flowed 135 bbls. of oil through choke in 24 hours.

In the Sims area, Skelly Oil Co. No. 1 R. R. Sims C, C SE SW section 3-23-37, was unable to recover lost tools and was plugged and abandoned at 3,388 feet, total depth.

In Eddy County, Continental Oil Co. No. 1 Barrett, C NW NW section 22-20-30, had a hole full of sulfur water and was dry and abandoned at 1,957 feet, total depth.

In Chaves County, J. & L. Drilling Co. No. 1 Hurd, C SE NW section 14-11-26, wildcat, found salt water at 1,335 feet and was ordered plugged and abandoned at 1,340 feet, total depth.

Monument Area

Continental Oil Co. No. 16-C-1 State, C SW NW sec. 16-20-37. T.D. 3,809 ft.; rebuilt derrick; to deepen.
Gulf Oil Corp. No. 1 Bates, C SE SE sec. 26-19-36. T.D. 3,973 ft.; C.O.
Phillips Pet. Co. No. 1 Mexico-State, C NE NE sec. 30-20-37. T.D. 3,843 ft.; testing.
Phillips Pet. Co. No. 1 Quapaw-State, sec. 10-20-37. T.D. 3,862 ft.; swabbed 56 bbls. oil in 24 hrs.; acidized.
Repollo Oil Co. No. 7 Barber, sec. 8-20-37. T.D. 3,840 ft.; preparing to run csg.
Continental Oil Co. No. 4-B-18 Britt, sec. 18-20-37. T.D. 3,866 ft.; testing.
Amerada Pet. Corp. No. 2-M State, sec. 13-20-36. T.D. 3,865 ft.; flowed 446 bbls. oil in 24 hrs.
Amerada Pet. Corp. No. 2-Y State, sec. 17-20-37. T.D. 3,854 ft.; flowed 42 bbls. oil in 1 hr.
Gulf Oil Corp. No. 8 Ramsey, sec. 17-20-37. Drlg. 560 ft.
Gulf Oil Corp. No. 3 White, sec. 25-20-36. Drlg. 1,897 ft.
Phillips Pet. Co. No. 2 Hobbs, sec. 18-20-37. Drlg. 3,300 ft.
Phillips Pet. Co. No. 3 Mexico, sec. 18-20-37. Drlg. 3,545 ft.
Atlantic Prod. Co. No. 1-O State, sec. 32-20-37. Drlg. 1,285 ft.
Empire O. & R. Co. No. 1 Persons, sec. 27-19-36. Rig.
Skelly Oil Co. No. 5 Van Etten, sec. 9-20-37. T.D. 1,168 ft.; set 9⅝-in. 1,158 ft.
Skelly Oil Co. No. 6 Van Etten, sec. 9-20-37. T.D. 3,780 ft.; set 7-in. csg.
Continental Oil Co. No. 17-A-4 State, C NE SW sec. 17-19-37. Drlg. 3,075 ft.
Amerada Pet. Corp. No. 3 Laughlin, C NW NE sec. 9-20-37. Drlg. 1,411 ft.
Continental Oil Co. No. 18-B-5 Britt, C SW SW sec. 18-20-37. T.D. 245 ft.; running csg.
Continental Oil Co. No. 11-A-5 Sanderson, NE SE SW sec. 11-20-36. Drlg. 3,335 ft.
Ohio Oil Co. No. 2 State-Hansen, C W½ SW NE sec. 16-20-37. R.U.R.
Amerada Pet. Corp. No. 4-D State, sec. 1-20-36. Drlg. 3,280 ft.
Amerada Pet. Corp. No. 4-T State, sec. 25-19-36. Drlg. 3,000 ft.
Amerada Pet. Corp. No. 2-B Weir, sec. 25-19-36. Drlg. 1,100 ft.
Gulf Oil Corp. No. 4-F Bell-State, sec. 36-20-36. Drk.
Repollo Oil Co. No. 5 Byrd, sec. 11-20-36. Drlg. 3,090 ft.
Texas Co. No. 8 Lieu Lands, sec. 20-20-37. Drlg. 3,470 ft.
Phillips Pet. Co. No. 3 Hobbs, SW sec. 18-20-37. T.D. 1,091 ft.; set 9⅝-in. 1,074 ft.
Amerada Pet. Corp. No. 2-Q State, SE sec. 16-20-37. Drlg. 2,410 ft.
Texas Co. No. 3 Sanders, SE sec. 18-19-27. Drlg. 1,610 ft.
Texas Co. No. 9 Lieu Lands, NW sec. 19-20-37. Drlg. 380 ft.
Sun Oil Co. No. 1 Barr, SW sec. 24-19-38. Drk.
Tide Water Oil Co. No. 2-T State, C NW NW sec. 17-19-37. R.U.R.
Gulf Oil Corp. No. 5 White, C NE NE sec. 25-20-36. Drlg. 850 ft.
Gulf Oil Corp. No. 5-F Bell, C SW SW sec. 36-20-36. T.D. 773 ft.; S.D.
Atlantic Ref. Co. No. 2-O State, NW sec. 32-20-37. Loc.
Gulf Oil Corp. No. 1 Butler, SE sec. 19-20-37. Cellar and pits.
Stanolind O. & G. Co. No. 3-A Gilluly, NE sec. 25-20-36. Loc.
Tide Water Oil Co. No. 1-K State, SW sec. 13-20-36. Loc.
Repollo Oil Co. No. 4-B Phillips, NW SW NW sec. 31-19-37. Digging cellar.
Shell Pet. Corp. No. 3-E State, C SE NW sec. 13-20-36. Loc.
Humble O. & R. Co. No. 1 Fopeano, C SE SW sec. 25-20-36. Cellar, pits.

Chaves County

English & Harmon No. 1 Billingslea, SE sec. 9-15-29. T.D. 2,695 ft.; set csg.

Eunice Area

Getty Oil Corp. No. 1 State D, C SE NE sec. 32-20-37. T.D. 3,860 ft.; C.O.
Jim Murray No. 4 State-Wallace, sec. 3-21-36. Cellar.
Gulf Oil Corp. No. 1 Bell-Ramsey B, C SW SW sec. 29-20-37. T.D. 3,840 ft.; standardizing.
Tide Water Associated Oil Co. No. 1 Marshall, C SW NE sec. 13-21-36. T.D. 4,005 ft.; P.B. 3,770 ft.; S.D.
Ohio Oil Co. No. 6 McDonald, C SE SW sec. 16-22-36. Drlg. 3,430 ft.
Devonian Oil Co. No. 2 State, SE sec. 3-2136. T.D. 3,843 ft.; P.B. 3,840 ft.; R.U. to pump.
Humble O. & R. Co. No. 1-G State, sec. 23-21-36. T.D. 3,860 ft.; to shoot.
Gulf Oil Corp. No. 2-E Bell-State, sec. 11-21-36. Drlg. 3,700 ft.
Gulf Oil Corp. No. 4 Campbell, sec. 7-21-36. Drlg. 3,110 ft.
Empire O. & R. Co. No. 1-G State, sec. 2-21-36. Drlg. 3,585 ft.
Gulf Oil Corp. No. 5 Collins, sec. 14-21-36. R.U.R.
Gulf Oil Corp. No. 8-C Orcutt, sec. 6-21-36. Drlg. 3,600 ft.
Stanolind O. & G. Co. No. 1 McQuatters, sec. 11-21-36. T.D. 3,847 ft.; pulling tubing.
Stanolind O. & G. Co. No. 1-A Langlie, sec. 11-21-36. T.D. 3,466 ft.; flowed 37 bbls. oil hourly.
Humble O. & R. Co. No. 2-G State, C NE NW sec. 23-21-36. Drk.
Stanolind O. & G. Co. No. 1 Hill, C Lot 16, sec. 5-21-36. Drk.
Gulf Oil Corp. No. 4-C Arnott-Ramsey, sec. 21-21-36. Drlg. 3,790 ft.
Republic Prod. Co. No. 1 State, SE sec. 12-21-35. T.D. 254 ft.; set 13-in. csg. 245 ft.
Magnolia Pet. Co. No. 4 Carson, SW sec. 28-21-37. T.D. 1,350 ft.; W.O.S.T.
Gulf Oil Corp. No. 3 King, NW sec. 28-21-37. Drk.
Stanolind O. & G. Co. No. 2 McQuatters, C NW NE sec. 11-21-36. Cellar, pits.
Continental Oil Co. No. B-30-1 Lockhart, C SE SW sec. 30-21-36. Loc.

Dona Ana County

Juels C. Bertrand No. 1 Casad Permit, sec. 24-26-5e. T.D. 47 ft.; S.D.O.

Hobbs Area

Stanolind O. & G. Co. No. 8 Terry, C NW SE sec. 9-19-38. Loc.

Sims Area

J. E. Farrell No. 1-A Walden, C SW NW sec. 15-22-37. T.D. 3,746 ft.; testing.
Skelly Oil Co No. 1 Stilcher, sec. 4-22-37. T.D. 3,750 ft.; testing.
Gulf Oil Corp. No. 1 Davis, sec. 8-23-27. Drlg. 3,252 ft.
J. E. Farrell No. 2-B Walden, C NE SW sec. 15-22-37. T.D. 3,460 ft.; to kill well.
J. E. Farrell No. 2-C Walden, C SE SW sec. 15-22-37. T.D. 3,550 ft.; fishing.
Empire O. & R. Co. No. 2 Walden, sec. 21-22-37. Drlg. 2,314 ft.
Skelly Oil Co. No. 2 H. O. Sims, sec. 4-23-37. T.D. 3,400 ft.; waiting on tools.
Skelly Oil Co. No. 5 R. R. Sims, sec. 3-23-47. Drlg. 2,911 ft.
Tide Water Oil Co. No. 3 Walden, sec. 21-22-37. Drlg. 2,500 ft.
Skelly Oil Co. No. 2 G. W. Sims, sec. 9-23-37. T.D. 3,713 ft.; running tubing.
Continental Oil Co. No. 21-A-2 Elliott, C SW SE sec. 21-22-37. T.D. 3,366 ft.; set 7⅝-in.
Skelly Oil Co. No. 3 R. R. Sims, sec. 4-23-37. T.D. 3,670 ft.; C.O.
Skelly Oil Co. No. 4 R. R. Sims, sec. 4-23-37. Drlg. 3,600 ft.
Amerada Pet. Corp. No. 1 Corrigan, SW SW NE sec. 4-22-37. Drk.
Rowan Drilling Co. No. 1 Walden, C NW NW sec. 15-22-37. Drlg. 1,130 ft.
Gulf Oil Corp. No. 1 Baker, C SE SE sec. 5-22-37. Drk.
Skelly Oil Co. No. 3 H. O. Simms, NW sec. 3-23-37. Cellar and pits.
Rowan Drlg. Co. No. 1-A Elliott, SW sec. 27-22-37. Cellar and pits.
Skelly Oil Co. No. 1-A Sims C, sec. 3-23-37. Loc.
Gulf Oil Corp. No. 1 Monda, C SE SW sec. 21-22-37. M.I.M.
W. H. Street No. 2 Wood, C SW NE sec. 22-22-37. Cellar and pits.

Cooper Area

Southern Oil Corp. No. 1 Gates, C SW NW sec. 23-24-26. T.D. 3,514 ft.; S.D. for orders.

Lea County—Miscellaneous

Brown & Reynolds No. 1 Parcell, C NW SE sec. 8-21-38. Wildcat; T.D. 4,397 ft.; P.B. 4,386 ft.; testing.
Amon G. Carter No. 2 Elliott, C NE SW sec. 22-22-37. T.D. 3,622 ft.; C.O.
Magnolia Pet. Co. No. 1 State G, NW NW NE sec. 24-17-34. T.D. 4,905 ft.; P.B. 4,794 ft.; C.O.
Continental Oil Co. No. 1 Wantz, C SW SW sec. 21-21-37. T.D. 3,872 ft.; running tubing.
Samedan Oil Co. No. 3 Hughes, sec. 4-23-27. T.D. 3,631 ft.; C.O.
Texas Co. No. 2 Black, sec. 21-24-37. Drlg. 3,360 ft.
Gulf Oil Corp. No. 1 Hardy, C SE SW sec. 20-21-37. T.D. 3,810 ft.; testing.
Anderson-Prichard Oil Corp. No. 1 Wells, C SE SE sec. 5-25-37. Drlg. 2,984 ft.
Herschback et al No. 1 Alston, C SW NE sec. 31-17-37. Drlg. 4,555 ft.
Williams & Cockburn No. 3 Miller, C SW SW sec. 23-17-32. T.D. 3,870 ft.; C.O.
Stanolind O. & G. Co. No. 2 Meyers, SW sec. 4-24-37. T.D. 3,432 ft.; set 5½-in. 3,368 ft.
Stanolind O. & G. Co. No. 3 Meyers, SE sec. 4-24-37. Drk.
Gulf Oil Corp. No. 1 Boyd, sec. 23-22-37. T.D. 3,681 ft.; testing.
Gulf Oil Corp. No. 2 King, sec. 28-21-37. T.D. 3,800 ft.; testing.
Gulf Oil Corp. No. 1 Shahan, sec. 33-25-37. Wildcat; T.D. 3,280 ft.; acidized; flowed 153 bbls. oil in 2 hrs.
Maljamar O. & G. Co. No. 3 Mitchell, C SE NE sec. 20-17-32. Drlg. 812 ft.

Texas Co. No. 1 Fristoe, C SW NW sec. 35-24-37. T.D. 3,501 ft.; set 7-in. 3,272 ft.
Stanolind O. & G. Co. No. 5 Meyers, sec. 22-34-37. Drlg. 2,968 ft.
Magnolia Pet. Co. No. 1 Hanna, sec. 7-26-38. Wildcat; drlg. 1,895 ft.
Empire O. & R. Co. No. 3-A Closson, sec. 6-22-36. T.D. 2,150 ft.; to recement pipe.
Gulf Oil Corp. No. 1 Knight, sec. 27-24-37. Drlg. 2,387 ft.
Harry Leonard No. 1 Siddall, sec. 6-20-38. T.D. 4,212 ft.; to test.
Shell Pet. Corp. and Devonian Oil Co. No. 2 Christmas, sec. 21-22-36. Drlg. 3,750 ft.
Humble O. & R. Co. No. 1 Greenwood, sec. 92-2-37. T.D. 3,767 ft.; acidized; flowed 59 bbls. oil daily.
Landreth Prod. Co. No. 2 Grizzell, sec. 5-22-37. T.D. 300 ft.; set 10-in. 290 ft.
Magnolia Pet. Co. No. 3 Cary, sec. 21-22-37. T.D. 1,300 ft.; W.O.S.T.
Repollo Oil Co. No. 1 Fowler, sec. 9-24-37. Drlg. 3,332 ft.
El Paso Natural Gas Co. No. 1 Camp, C SW SW sec. 6-24-37. T.D. 2,785 ft.; set 9⅝-in. 2,780 ft.
Schermerhorn Oil Co. No. 1 Woolworth, C NW NE sec. 28-24-37. T.D. 1,393 ft.; set 8¼-in.
Gulf Oil Corp. No. 1 Westfall, SE SW SE sec. 15-25-37. T.D. 3,278 ft.; running csg.
Continental Oil Co. No. 1 Burger, C NW SW sec. 19-20-38. T.D. 3,695 ft.; set csg.
Culbertson-Irwin et al No. 1 Moseley, SE NE SW sec. 34-24-37. Drlg. 200 ft.
Continental Oil Co. No. 1-A-15 Cline, NW sec. 15-23-37. Wildcat; T.D. 1,225 ft.; set 7-in. csg.
Repollo Oil Co. No. 2 Christmas, sec. 28-22-37. T.D. 250 ft.; set 12½-in. 244 ft.
Repollo Oil Co. No. 1 Turner, sec. 29-21-37. Drlg. 418 ft.
Shell Pet. Corp. No. 1 Rinewalt, NW sec. 4-22-37. T.D. 1,219 ft.; set 9⅝-in. 1,213 ft.
F. J. Danglade No. 1 Christmas, C SE NE sec. 5-22-37. Drlg. 1,530 ft.
Devonian Oil Co. No. 2 Christmas, SE sec. 28-22-37. Cellar and pits.
Devonian Oil Co. No. 3 Christmas, C SW SE sec. 28-22-37. Cellar and pits.
Magnolia Pet. Co. No. 4 Cary, C SW SW sec. 21-22-37. Derrick.
Texas Pacific Coal & Oil Co. No. 4-A State, C SW SW sec. 9-22-36. Cellar and pits.
Texas Co. No. 2-A Rhoades, SE NW SE sec. 22-26-37. Rigging up rotary.
Stanolind O. & G. Co. No. 1 Turner, C NW NW sec. 20-20-38. T.D. 306 ft.; set 12½-in. 304 ft.
Ajax Drlg. Corp. No. 1 Lanehart, SW sec. 21-25-37. Rigging up machine.
Culbertson & Irwin No. 1 Boesche, NE sec. 2-21-32. Wildcat; location.
Gulf Oil Corp. No. 2 Westfall, SE sec. 15-25-37. Derrick.
Jal Natural Gas Corp. No. 2 Justis, NE sec. 20-25-37. Moving in material.
Mid-Continent Pet. Corp. No. 2 Greer, NW sec. 21-22-36. Cellar and pits.
Plains Prod. Co. No. 1 Humphreys, NE sec. 3-25-37. Loc.
Texas Co. No. 2 Lea, NE sec. 15-20-34. Loc.
Tide Water Oil Co. No. 1 Day, C NE NW sec. 6-22-36. Loc.
Continental Oil Co. No. A-5-2 Farney, C NE SE sec. 5-23-36. Loc.
Western Gas Co. No. 3 Harrison, C NW SW sec. 20-24-37. Loc.
Repollo Oil Co. No. 3 Jamison, SW NE NE sec. 21-24-37. M.I.M.
Sun Oil Co. No. 3 Stuart, C NE NE sec. 15-25-37. Cellar and pits.
Shell Pet. Corp. No. 4-M State, C Lot 16, sec. 1-21-35. Cellar and pits.
Ohio Oil Co. No. 2 Turner, SW NW SE sec. 29-21-37. Cellar and pits.

Eddy County

Adams et al No. 1 Page, sec. 15-21-18. Wildcat; T.D. 100 ft.; S.D.O.
Republic Prod. Co. No. 7 Russell A, NW SE NW sec. 18-17-31. T.D. 3,535 ft.; testing.
Barnsdall Oil Co. No. 5 Dodd, sec. 22-17-29. T.D. 2,757 ft.; P.B. 2,730 ft.; shot 2,580-2,730 ft.; est. 60 bbls.
Flint Prod. Co. No. 1-B State, SE sec. 16-17-30. Drlg. 3,695 ft.
Murchison No. 1-B State, SE sec. 16-17-30. Drlg. 3,700 ft.
Carper Drlg. No. 2 Gissler, NW sec. 23-17-30. Loc.
Repollo Oil Co. No. 1-D Parke, sec. 15-17-30. Drlg. 2,680 ft.
Flynn, Welch, Inc., No. 1-B Stevens, sec. 13-17-30. T.D. 3,010 ft.; set 5½-in. csg. 3,009 ft.
Neil Wills et al No. 1 Stovall-Wood, sec. 20-20-30. T.D. 1,435 ft.; swb. 125 bbls. oil daily.
Carlsbad Oil Co. No. 1 Pecos Irrigation, C NE SE sec. 15-25-28. Drlg. 412 ft.
Barnsdall Oil Co. No. 6 Dodd, sec. 22-17-29. Drlg. 2,475 ft.
Grayburg Oil Co. No. 3 Keely, SE NE NE sec. 24-17-29. Drlg. 2,154 ft.
F. W. & Y. Oil Co. No. 3 Jackson, C NW SE sec. 13-17-30. T.D. 575 ft.; showing water.
F. W. & Y. Oil Co. No. 4 Gissler, C SE SE sec. 14-17-30. Drlg. 2,230 ft.
F. W. & Y. Oil Co. No. 5 Gissler, C NE SE sec. 14-17-30. Drlg. 1,598 ft.
Harry Leonard No. 10 State, SE SW SW sec. 27-17-29. Drlg. 1,990 ft.
Fred Brainerd No. 2 Brainerd, sec. 5-18-27. M.I.M.
W. A. Nichols No. 1 Johnson, NE sec. 35-16-21. Wildcat; R.U.M.
F. E. Baker No. 4 Eddy, NE sec. 12-22-27. T.D. 55 ft.; M.I.M.
Alscott Oil Co. No. 1 Goodale, SW NW SE sec. 30-18-29. M.I.M.
H. & W. Drlg. Co. No. 1 Danford, C SE SE sec. 9-22-29. M.I.M.
Neil H. Wills et al No. 1 Morris Hoover, C SW NW sec. 20-20-37. M.I.M.
Franklin Pet. Corp. No. 1 Nelson, NW sec. 4-18-30. Wildcat; spudded.
Pool Oil & Gas Co. No. 1 Reed, SW sec. 28-24-28. Wildcat; spudded.
F. W. & Y. Oil Co. No. 4-A Jackson, NE sec. 13-17-30. Loc.
F. W. & Y. Oil Co. No. 3-X Jackson, SE sec. 13-17-30. Loc.
F. W. & Y. Oil Co. No. 2-A Stevens, C NW SW sec. 13-17-30. Loc.

Roosevelt County

Dummit Oil Co. No. 1 Todd, SE SE sec. 34-3n-29. T.D. 656 ft.; S.D.

Curry County

Bond & Harrison No. 1 Hart Ranch, C NW SE sec. 13-2n-31. T.D. 1,246 ft.; W.O.S.T.

Otero County

George Muldey No. 1 State, SW cor. sec. 11-25-8e. T.D. 263 ft.; S.D.

Fred Turner No. 1 Hattie Evans, NW NW SW sec. 22-14-12. O.W.D.D.; wildcat; drlg. 2,340 ft.

McKinley County

S. Dysart No. 1 Government, NE sec. 14-14-10w. T.D. 1,390 ft.; fishing.

NORTHWEST NEW MEXICO

Bernalillo County

Norins Realty Co., Inc., No. 2 North Albuquerque, NE SE NW sec. 19-11n-4e. Drlg. 3,200 ft.

San Juan County

Continental Oil Co. No. 60 Tribal, NW NW NE sec. 2-29n-19w. Rmg. at 750 ft.
Anna Oil Corp. No. 6 Govt., SW NE NE sec. 33-30n-11w. S.D. at 370 ft.
Jack Amenda No. 4 Hart, NW NE SW sec. 25-30n-12w. Drlg. 1,785 ft.

Socorro County

R. Allen Brown, Tr., No. 1 Belen Grant, SE NW sec. 16-2n-1e. Bldg. rig.

Valencia County

C. A. Grober et al No. 1 Fuqua, NE NE sec. 19-5n-3e. S.D. 440 ft. in lime.

COLORADO

Adams County

Glenridge Oil Co. No. 1 Hills, SE SE SE sec. 27-3s-64w. T.D. 4,345 ft.; pipe recovered; W.O. new string.

Bent County

Indian Territory Illuminating Oil Co. and Olson Drlg. Co. No. 1 Arbes, C Lot 2, sec. 2-21s-48w. Some mat. on loc.

Boulder County

Boulder Prod. & Dev. Co. No. 1 Harlow Est., SE NE sec. 36-2n-71w. T.D. 365 ft.; S.G.; rng. 5 3/16-in.

Cheyenne County

Brittel Oil, Inc., No. 1 Seip, C NE SW sec. 26-12s-47w. Cmtd. 18-in. at 100 ft.; drlg. ahead, daylight only.

Larimer County

Great West O. & G. Co. No. 1 Haworth, C SW SE sec. 16-4n-69w. M.I.M.
L. D. Charboneau et al No. 1 Thompson, C NE sec. 12-4n-70w. Drlg. 153 ft.

Grand County

Interstate O. & R. Co. No. 1 Hinman, NE SE NW sec. 11-2n-81w. T.D. 1,997 ft.; resuming.

Huerfano County

S. W. Pressey No. 1 Ojo, SW NE sec. 10-29s-60w. Drlg. 3,350 ft. after lowering 5 3/16-in. to bttm. to S.O. cavings caused by gas; Dakota expected 3,900 ft.

Lincoln County

Consolidated Smelting & Metals Corp. No. 1 Hancock, NE NE SW sec. 7-17s-52w. S.D. 2,450 ft. for engine repairs.

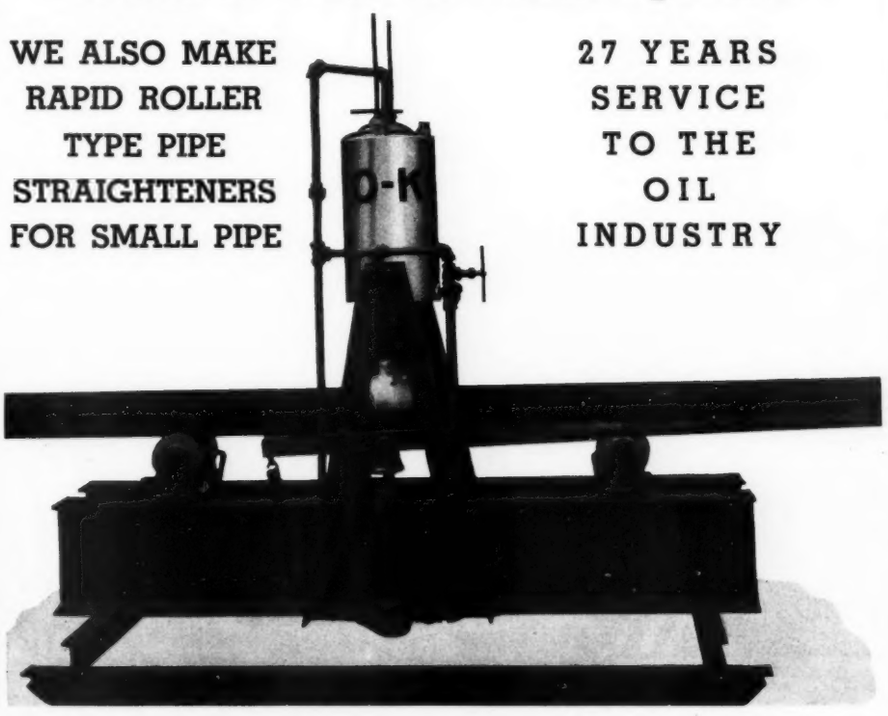
Moffat County

Location was released this week for the first in-

O-K Hydraulic Pipe Straightener

Model D—Hand or Power Operated

WE ALSO MAKE RAPID ROLLER TYPE PIPE STRAIGHTENERS FOR SMALL PIPE



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A compact, powerful Pipe Straightening and Bending unit. Designed and built by pipe reconditioning engineers . . . Ample capacity (60,000 lbs.) for all pipe and casing up to 8″. Especially adapted for use in straightening drill pipe, Kelly bars and structural shapes. Noted for its quick and easy operation. Adjustable at all needed points. Made in larger sizes. Minimum maintenance expense.

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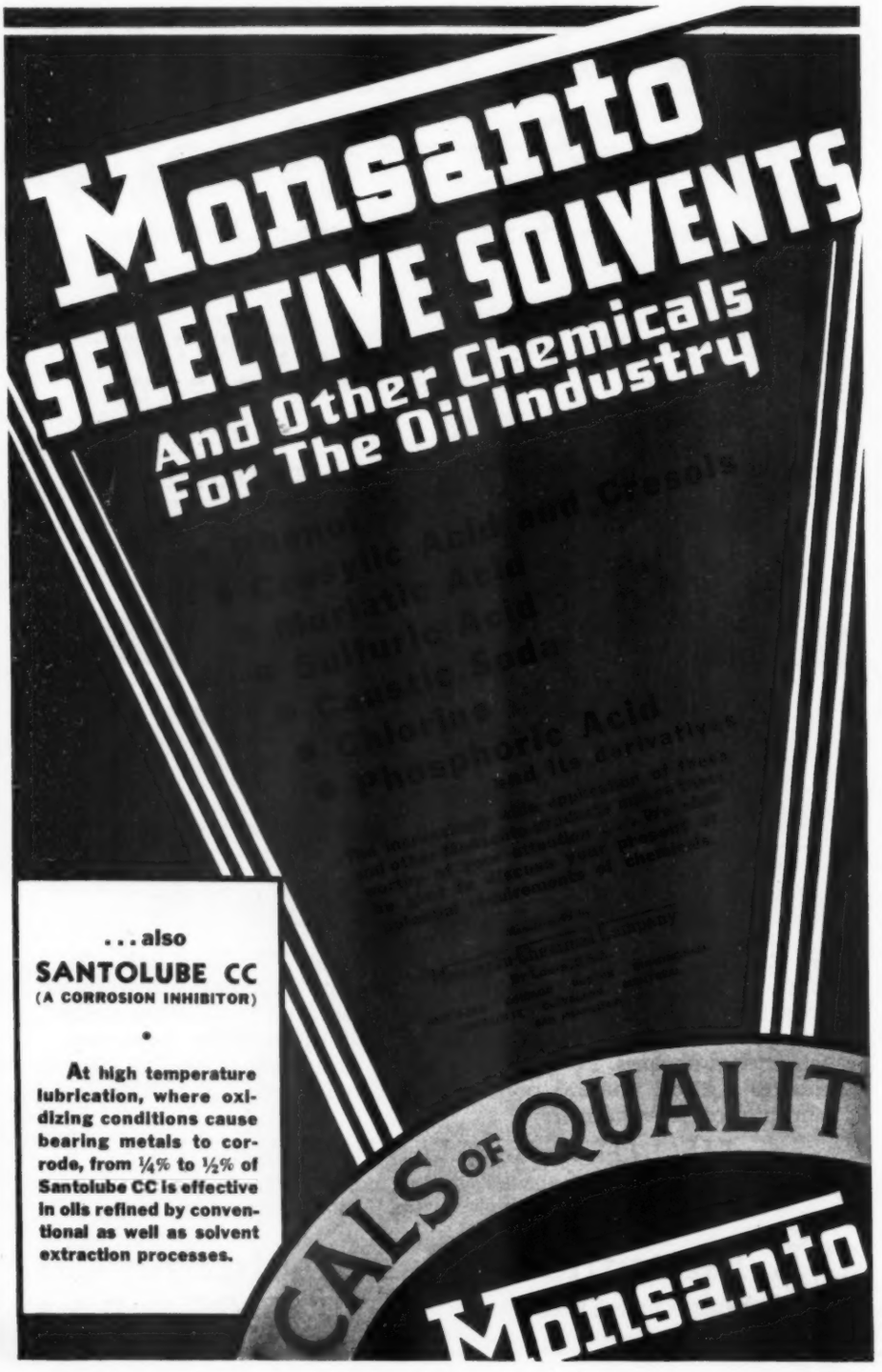
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dependent well in the Powder Wash field, drilling heretofore having been confined to the operations of the Mountain Fuel Supply Co. The new operation is the Universal Consolidated Oil Co. and the Italo Petroleum Corp. No. 1 Wanner-Government, C SE NE section 36-12n-98w. The location is a mile to the southeast of the Mountain Fuel Supply Co. No. 1 Stewart, the oil discovery, and 2 miles west of No. 1 Musser, the gas discovery. Universal Consolidated, which is a Los Angeles concern, and Italo, of San Francisco, have joint leases on 2,240 acres in the Powder Wash district, of which 640 acres is close in. They also have 19,000 acres along the Cherokee Ridge field across the line in Wyoming.

Universal Consol. O. Co. and Italo Pet. Corp No. 1 Wanner-Govt., C SE NE sec. 36-12n-98w. M.I. rotary, (first report).
Morapas Pet. Co. No. 1 Coles, SW SW SE sec. 1-3n-92w. Drlg. 635 ft.
Mountain Fuel Supply Co. No. 1 Donnell, C SE NE sec. 31-12n-97w. Drlg. 4,470 ft.
Anderson-Kerr Drlg. Co. et al No. 1 Denise, C SE SE sec. 19-9n-99w. T.D. 2,240 ft.; rng. 10-in. to bttm.
Anderson-Kerr Drlg. Co. No. 1 Marrs, C SE NE sec. 17-11n-100w. Prep. to M.I. company tools.
Texas Co. No. 4 Iles Inv. Co., Lot 7, sec. 23-4n-92w. Iles field. R.U.R. (first report.)

Morgan County

Swisher et al No. 1 Lunt, SE cor. sec. 3-4n-60w. T.D. 1,718 ft.; W.O. shooter.

Park County

South Park Oil Co. No. 1 Lemar, NE NE SE sec. 34-11s-75w. T.D. 4,567 ft.; sidetrkg. at 4,300 ft.

Rio Blanco County

The Texas Co. and the California Co. are having a seismograph survey of the Wilson Creek structure made before finally locating their deep test. Tentative location is on the Freeman permit in SE SE section 27-3n-94w.

WYOMING

Albany County

Murphy Oil Co. No. 7 Holst, NE NE SE sec. 13-17n-77w. Drlg. 2,358 ft.
Hal Blakeman No. 1 Chapple, C NE NW sec. 33-21n-76w. T.D. 1,681 ft.; installing heavier equip.
Murphy Oil Co. No. 1 Holst-Woolf, NW NW NW sec. 19-17n-76w. T.D. 4,067 ft.; tstg. Dakota through perforated 7-in.

Big Horn County

Ohio Oil Co. No. 2 Byron-Baker, SW NW sec. 23-56n-97w. Bldg. rig.
Stock Oil Co. No. 1 Stock-Jones, SE cor. sec. 52-56n-97w Spdg.
Ohio Oil Co. No. 1 Pryde, C SW SE sec. 24-56n-97w. Drlg. 1,852 ft.
Ohio Oil Co. No. 1 Smith, NE cor. Lot 61, sec. 33-56n-97w. Drlg. 2,671 ft.
Woods-Callahan Oil Co., Ltd., and Wyoming O. & R. Co. No. 1 Evans, NE NE NW sec. 12-44n-91w. M.I. rot. rig from California.

Campbell County

G. J. Sherin et al No. 1 Rodes, NE SE SW sec. 24-49n-74w. Drlg. 500 ft.

Carbon County

The Ohio Oil Co. and the California Co. have another large well in the Medicine Bow field in their No. 2 Kyle, C SE SE section 26-21n-79w, a joint operation, which averaged 135 bbls. per hour and 17,000,000 feet of gas at 5,668 feet after plugging back from 5,712 feet. It is an inside well half a mile south of the discovery and a north offset to their No. 2 Union Pacific. It is producing from the Upper Sundance at 5,473-5,544 feet and the second Sundance at 5,660-68 feet. It showed water in the lower part of the second Sundance.

The same companies are moving in material for their No. 3-A Kyle, a west offset to the discovery and an outside well.

Ohio Oil Co.-California Co. No. 3-A Kyle, C SW NE sec. 26-21n-79w. M.I.M. (first report.)
Ohio Oil Co. No. 6 Diamond Cattle, NW NW sec. 35-20n-78w. T.D. 3,334 ft.; P.B. to 3,312 ft.; tstg.
Medicine Bow Oil Co. No. 1 Hintze-Govt., C NE SE sec. 18-22n-78w. T.D. 2,180 ft.; prep. to shoot second Sundance.
Ohio Oil Co.-California Co. No. 4 Union Pacific, C SW SW sec. 25-21n-79w. T.D. 5,617 ft.; P.B. to 5,475 ft.; tstg. upper Sundance.
Ohio Oil Co.-Medicine Bow Oil Co. No. 1 U. P.-Wister, C NW SW sec. 17-22n-78w. R.U. ready to spud.
Ohio Oil Co. No. 8 Dixon, SE NE SE sec. 34-20n-78w Drlg. 4,042 ft. in red beds.

Converse County

Elbe Oil Ld. & Dev. Co. No. 1 Benham, NW NE sec. 5-31-70w. M.I.M.; (first report).
Tom Carney No. 1 Beaver, SE SE SW sec. 28-35n-68w. M.I.M.
Chadron-Osage Oil Co. No. 1 State, SW cor. sec. 16-32n-69w. T.D. 3,500 ft.; S.O.; prep. to U.R. 8¼-in. for W.S.O.
Wyoming Southern Oil Co. No. 1 Evert, NW NW SW sec. 26-32n-69w. Drlg. 495 ft.; prep. to run prod. string.

Fremont County

H. Kenyon Burch No. 1 Enos, CEL NE NE sec. 28-3n-1w. Drlg. 221 ft.
Ben Stewart No. 1 Darnell, NE SE sec. 26-3n-1w. M.I.M. to test Frontier at 600 ft.; 1½ mi. E of Pilot Butte wells.

Lincoln County

H. M. Eller et al No. 4 Govt., SE NW SW sec. 32-19n-116w. T.D. 401 ft.; will test S.O. in lenticular sd. at 397-401 ft.

Place Oil Co. No. 1 Davis, SE SE SE sec. 9-26n-113w. T.D. 870 ft.; tstg. S.O. at 860-870 ft.

Johnson County

Carter Oil Co. No. 3 Rider, C NW SE sec. 17-48n-82w. Spdg.

Natrona County

Studies being made by the principal operators for unitizing the Salt Creek field have been worked out to the point where a tentative agreement has been reached with the government to effectuate such unitization. This agreement will be submitted shortly to other operators in the field for their consideration. One of the results of successful negotiations of the agreement will be the extension of all leases within the unitized area for the life of the field. The majority of the present leases, while carrying rights for renewal for successive periods of 10 years, expire in 1941.

Stanolind O. & G. Co. No. 1 T.P., C NW SE sec. 26-40n-79w. Drlg. 626 ft.; 16-in. cmtd. 400 ft.
Wyalta Oil Co. No. 4 Govt., NW NW sec. 5-29n-81w. Cmtd. 6⅝-in. on top of Sundance at 1,082 ft.; rng. 2-in. tbg. to test at 1,030-72 ft.
Wyalta Oil Co. No. 5 Govt., SW SW sec. 30-30n-81w. Tstg. at 1,021 ft.
Wyalta Oil Co. No. 6 Govt., NE SE NW sec. 5-29n-81w. Cmtd. 10-in. at 704 ft.; Dakota at 565-664 ft.

Niobrara County

The Ohio Oil Co. No. 2 Richards & Comstock, near C NE SW section 32-36n-65w, Lance Creek field, was completed at 3,783 feet, in the red beds, for 20 bbls. natural per hour from the Basal Sundance at 3,778-87 feet. This is an old well deepened from the Upper Sundance. It was completed in 1932 for 140 bbls. black oil daily from the Upper Sundance at 3,589-3,643 feet. At that time the Lower Sundance had not been tested. Elevation is 4,366 feet.

The Ohio Oil Co. also has a near completion in its No. 2 Putnam, NE SW NW section 4-35n-65w, at 4,106 feet, total depth. On a drill stem test it made 30 bbls. per hour from the Basal Sundance at 4,085-96 feet. This, also, is an old well drilled deeper. It was originally completed in the Dakota at 3,430 feet for 20,000,000 feet of gas per day.

Continental Oil Co. No. 1 Leach, SW NE NE sec. 29-36n-64w. Bldg. rig.
Argo Oil Co. No. 4 Ford, SW NW SE sec. 33-36n-65w. R.U.
Argo Oil Co. No. 3 Ford, SW SW NW sec. 33-36n-65w. T.D. 4,052 ft.; prep. to test.
A. B. Cobb and Holly Dev. Co. No. 2 Novick, SE SE SW sec. 6-35n-65w. Drlg. 3,922 ft.; first Sundance 3,835-87 ft.
Continental Oil Co. No. 4 Schuricht B, NW SW SE sec. 6-35n-65w. Drlg. 2,235 ft. in sh.
Continental Oil Co. No. 8 Otto Rohlff, SW SW SE sec. 31-36n-65w. Bldg. dk.
Continental Oil Co. No. 10 Tom Bell Cattle, C SW NW sec. 34-36n-65w. Cg. 3,857 ft. in red shaly sd.; top Sundance 3,808 ft.
MacKinnie Oil & Drlg. Co. No. 2 Thompson, NW NW NE sec. 7-35n-65w. Drlg. 3,500 ft.
J. M. Huber Corp. No. 1 Lamb, SE SE SW sec. 27-36n-65w. T.D. 3,910 ft.; P.B. to 1,485 ft.; drlg. 1,497 ft. in new hole.
Ohio Oil Co. No. 5 Leo, NW NW SW sec. 35-36n-65w. Cmtd. 7-in. at 5,500 ft.; drlg. plug.

Park County

The General Petroleum Corp. No. 1 Government, a wildcat and also a discovery, on the Gooseberry dome, is having more trouble and completion again is delayed. It had good saturation in the Tensleep at 5,903-6,070 feet, but ran into water in the Amsden at 6,070 feet. It then plugged back to test the Tensleep. Oil stood 600 feet in the hole and it bailed around 125 bbls. per day. An attempt was then made to shoot the pay, but the shot exploded prematurely in the 9⅝-inch pipe at 5,350 feet. It is now milling on junk and cleaning out.

Resolute Oil Co. No. 1 Northern Pacific, C NE NW sec. 21-57n-101w. R.U.R.; (first report).
Kinney-Coastal Oil Co. No. 3 Govt., SW NW NE sec. 24-56n-97w. T.D. 4,338 ft.; R.U. to deepen.
Resolute Oil Co. No. 1 Govt., C NE NE sec. 20-57n-101w. Drlg. 2,645 ft.
General Pet. Corp. No. 1 Govt., NW NW NW sec. 33-47-100. T.D. 6,076 ft.; P.B. to Tensleep; C.O.

Platte County

Dividend O. & R. Co., Inc., No. 1, CSL NW SW sec. 17-24n-66. Resuming at 2,385 ft.

Sweetwater County

Mountain Fuel Supply Co. No. 1 Stone, C SW SW sec. 18-19n-103w, North Baxter Basin. R.U.R.; (first report).
Mountain Fuel Supply Co. No. 3 Union Pacific, SE NE sec. 15-16n-104w. Cmtd. 8⅝-in. at 2,446 ft.; W.O.C.

Uinta County

E. A. Ottman et al No. 1 Govt., C SE NW sec. 26-14n-119w. M.I.M. for cable tool test to Bear River form. at 1,600 ft.

Washakie County

Arlton & Doyle No. 1 Govt., SW SW SE sec. 29-48n-91w. T.D. 1,356 ft.; prep. to resume.
Yale Oil Corp. No. 2 Govt., CEL SE SE sec. 25-48n-91w. Loc.
Bruce Teeter No. 5 Govt., CSL SW SW sec. 40-48n-90w. Drlg. 100 ft.; 10-in. at 85 ft.
Christensen & Thorne No. 3-X Govt., NW SW SW sec. 31-48n-90w. Drlg. sh. 860 ft.
Wyoming O. & R. Co. No. 8 Govt., NW NE NW sec. 31-48n-90w. Drlg. 200 ft.; 10-in. at 79 ft.
Wyoming O. & R. Co. No. 7 Govt., SW NW NW sec. 30-48n-90w. Drlg. bl. sh. 710 ft.; 10-in. at 87 ft.

Weston County

One small pumper was completed in the Osage field in Charles Stough No. 8, CSL SW NW section 4-46n-63w, which made 2 bbls. per day from sand at 300 ft.

Chas. Stough No. 9, SE SW NE sec. 4-46n-63w. R.U.; (first report).
Henry Egert No. 6, C NE SE sec. 8-46n-63w. Spdg.; (first report).
Bert Higgins No. 5, CNL NW SW sec. 4-46n-63w. Drlg. 220 ft.; (first report).
R. L. Rose No. 7, C SW SE sec. 8-46n-63w. S.D. 250 ft.

MONTANA

Big Horn County

Big Horn O. & G. Co. No. 31, CWL SE NW sec. 23-1s-33e. Drlg. 625 ft.
Daniels Pet. Co. No. 1 May, C SE SE sec. 13-1s-33e. Drlg. 3,900 ft. with 2-in. bit.

Carbon County

Ohio Oil Co. No. 16 Kirt, C SE SE sec. 4-7s-21e. Cmtd. 12½-in. at 144 ft.; W.O.C.

Glacier County

A block of 9,960 acres of Blackfeet Indian tribal and allotted land in the Chalk Butte district west of the Cut Bank field was bid in at auction on May 21 by Frank R. Henry, of Chicago. The block is in Townships 35 and 36n, Range 8w. In the center of the block is a tract of 1,280 acres owned in fee by Joseph S. Irwin, geologist, which has been leased to Henry. Sale calls for a $15,000 bond guaranteeing that a well will be started in four months and the drilling of two wells each year thereafter. Mr. Henry plans to start the test some time in June. He is identified with a Chicago group interested in the Del Bonita structure in Alberta.

Cut Bank had no completions the past week and two new operations.

A. B. Cobb No. 5 Walburger, C NE SE sec. 35-35n-6w. R.O.G.; (first report).
Grant Oil Co. No. 1 Rueffen, C SW SE sec. 5-32n-5w. R.O.G.; (first report).
Montana Headlight Oil Co. No. 5 Britton, SE SW NE sec. 14-34n-6w. Drlg. 1,250 ft.; 10¾-in. at 545 ft.
R. C. Tarrant No. 4 Reickhoff, NE NE SE sec. 22-32-6w. R.U.
Glacier Prod. Co. No. 2 State-16, SW SW SW sec. 16-33n-5w. Spdg. 100 ft.
Glacier Prod. Co. No. 2 Neill, NE NE NE sec. 20-33n-5w. Cmtd. 10¾-in. at 607 ft.; Colo. 603 ft.

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Farrell Birmingham Co., Ansonia, Conn.
Florence Pipe Foundry & Machine Co., R. D. Wood Company, Philadelphia, selling agents.
Fulton Foundry & Machine Co., Cleveland, Ohio.
G. H. R. Foundry Co., Dayton, Ohio.
Greenlee Foundry Company, Chicago, Ill.
Hamilton Foundry & Machine Co., Hamilton, Ohio.
Kanawha Manufacturing Co., Charleston, West Va.
Kinney Iron Works, Los Angeles, Calif.
Koehring Company, Milwaukee, Wisc.
Michigan Valve & Foundry Co., Detroit, Mich.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Vulcan Foundry Company., Oakland, Calif.
Warren Foundry & Pipe Corporation, Phillipsburg, N. J.
Washington Iron Works, Seattle, Wash.

Texas Co. No. 4 Sec. 9 Unit, C NE NW sec. 9-32-5w. T.D. 400 ft.; will cmt. 10-in.
Texas Co. No. 2 Hardwick, C NE SE sec. 17-32n-5w. Loc.
Texas Co. No. 1 Lennon, C NW SE sec. 24-33n-6w. Drlg. 2,519 ft.
A. E. Wilkinson No. 3 All.-127, C SE SE sec. 1-32n-6w. R.U.
K. D. Pardee No. 1 Corrigeaux, NE NE SE sec. 35-34n-6w. Drlg. 600 ft.; Colo. 582 ft.
Hannah-Porter No. 3 All.-130, NW SE SW sec. 6-32n-5w. Drlg. 1,475 ft.
A. R. Pardue No. 1 Anderson, C SE SW sec. 31-32n-5w. Drlg. 1,300 ft.
A. E. Crumley No. 2 All.-112, C NW SW sec. 6-32n-5w. Drlg. 1,825 ft.
Glacier Prod. Co. No. 2 O'Brien, C NW SW sec. 32-34n-5w. Drlg. 1,890 ft.
Texas Co. No. 3 Unit 9, C SE SW sec. 9-32n-5w. Drlg. 2,880 ft.
Nadeau Bros. No. 4 Farmers State Bank, CSL NE sec. 17-33n-5w. Drlg. 1,865 ft.
Santa Rita O. & G. Co. No. 1 Rasmussen, C NE SW sec. 32-33n-5w. Cmtd. 7-in. 2,913 ft.
Annand-Hutchings No. 3 Federal Land Bank, NE SE SW sec. 11-34n-6w. Drlg. 2,625 ft.
R. E. Lee No. 1 Davis, C S½ SE sec. 15-32n-6w. Drlg. 2,275 ft.
Cut Bank Oil Trust No. 1 Yunck, SE SE SE sec. 23-34n-6w. Drlg. 2,760 ft.

Fallon County

Nagasco Corp. No. 1, C SE sec. 24-5n-6e. Drlg. 720 ft.

Judith Basin County

Fletcher E. Hunt No. 3, NW SE NE sec. 30-14n-15e. S.D. 1,400 ft.; Kootenai dry; will go to Madison.

Musselshell County

R. C. Tarrant and J. C. Johnson No. 24-A Govt., SW NW NW sec. 25-11n-24e. T.D. 465 ft.; R.U. to resume (formerly Geo. Gregory et al).

Park County

Ben W. Ryan et al No. 1 Burgess, SE SW NW sec. 28-2s-11e. T.D. 606 ft.; prep. to resume.

Pondera County

Gordon Campbell No. 1 Hughes, NW NE NW sec. 12-30n-4w. S.D. 2,560 ft.; 1,400 ft. sul. w.
Clinch Pet., Ltd., No. 1 Hollam, NW NW NW sec. 12-28n-6w. Drlg. 2,620 ft.

Phillips County

City of Malta No. 1 Govt., C SE SE sec. 18-30n-30e. Drlg. 1,150 ft.
R. G. Parrent No. 1 Hartman, C NW SE sec. 12-24n-25e. Drlg. 898 ft.

Petroleum County

O. B. Canfield No. 1 Govt., CEL SE NE sec. 21-17n-24e. Rng. 3-in. to set at 750 ft.

Toole County

T. P. Kyle has made a location for another well on the Bow and Arrow dome in his No. 1 Kielbaugh and has let contract to Coolidge & Coolidge. Location is 2 miles north and a little west of No. 1 Clark, the discovery well, which was completed in 1935 at 2,080 feet for 4,600,000 feet of gas, and the same distance southeast of No. 1 Wolnsti, which had water in the Cut Bank sand at 2,516 feet. He has sold his gas well to the Montana Gas Corp.

There were four completions in the Kevin-Sunburst field. A. E. Crumley's No. 7 Jarrett, CEL SE NE section 29-35n-2w, made half a bailer of oil per hour at 1,478 feet and will acidize. It had the Sunburst at 1,200-55 feet and the contact at 1,470 feet.

Consolidated Gas Co. No. 1 Fee, CSL SE NW section 29-35n-2w, made 12 bbls. per day naturally at 1,512 feet and will acidize. It had the Sunburst at 1,209-82 feet and the contact at 1,509 feet.

Nepstad & Vanderpas No. 2 Solberg, C SW NE section 29-35n-3w, was acidized and is making 9 bbls. per hour initial from the contact at 1,755 feet, total depth 1,780 feet.

Agen & Krause No. 1 Krause, SE cor. section 9-35n-3w, was abandoned at 1,580 feet, after plugging back from 1,821 feet, when gas failed to hold up.

New Era Fuel Co. No. 1 Goeddertz, CWL NE SW sec. 12-35n-3w. Drlg. 1,400 ft. (cor. loc.)
A. C. Crumley No. 12 Shaw, SE NE NW sec. 35-36n-2w. Drlg. 320 ft.
Stanley Gray No. 1 Goeddertz, CWL NE SW sec. 12-35n-23w. Drlg. 440 ft.
A. C. Carney No. 2 Stockman, CSL NW NE sec. 11-35n-2w. Loc.
A. C. Carney No. 1 Stockman, CWL SE NE sec. 11-35n-2w. T.D. 1,465 ft.; rng. 6⅝-in.
Security Oil Co. No. 1 Kopsing, CWL SW SE sec. 24-34n-2w. Loc. (first report).
Capitol Oil Co. No. 1 Pace, C SE SW sec. 27-36n-1w. Drlg. 330 ft.
S. V. Day No. 3 Halter, NE NE NE sec. 17-35n-2w. Rig.
J. W. Perrin No. 1 Hogan, SW NE NW sec. 11-35n-3w. Drlg. 1,750 ft.
Lamont Pet. Co. No. 1 Van Note, NE NE NW sec. 30-36n-2w. Contract 1,509-12 ft.; dry, will acid.
Wm. Knight No. 2 Havland, CWL SE NW sec. 19-35n-2w. Drlg. 1,530 ft.
Twin Buttes Synd. No. 1 Thompson, NW NE NW sec. 33-35n-3w. Drlg. 1,650 ft.
Welch Bros. No. 2 Larum, SW SW NW sec. 25-35n-2w. T.D. 1,658 ft.; shot Sunburst at 1,625-58 feet. with 80 qts.; 300 ft. oil; C.O.
Watson et al No. 2 Leach, SE NE NE sec. 31-35n-3w. T.D. 1,635 ft.; cmtd. 6⅝-in.
Big West Oil Co. No. 7 Dahlquist, NW SE NE sec. 21-35n-3w. T.D. 1,827 ft.; dry at contact; will acidize.
A. Beardslee No. 6 Swears, SW SE NW sec. 9-35n-2w. Drlg. 1,100 ft.
Browning-Sunburst 32 Synd. No. 1 Goeddertz, NE NW SW sec. 21-36n-3w. Drlg. 1,300 ft. (cor. loc.)
Wm. McKnight No. 2 Havland, CWL SE NW sec. 19-35n-2w. Contact 1,574-1,626 ft.; acid. 750 and 1,000 gals.; stdg.
Rimrock Oil Co. No. 1 Govt., CEL SW NW sec. 29-35n-3w. Cmtd. 10-in. at 190 ft.
W. S. Knight No. 1 Gunderson, SW SE NW sec. 9-35n-2w. S.D. in Ellis-Madison contact at 1,572 ft.
Bryant Bros. No. 1 Lashbaugh, NE SW NW sec. 34-25n-2w. T.D. 850 ft.; R.U. heavier machine to resume.
Ogden-Kevin Oil Co. No. 7 Zachot, SE SW NW sec. 20-35n-1w. Drlg. 900 ft.
Gus Blaze No. 5 Burwash, CSL NE SW sec. 15-34n-1w. Drlg. 200 ft.
F. C. Platt No. 1 Roseth, SE SE NE sec. 35-35n-3w. Drlg. 1,085 ft.
Treasure State Oil Co. No. 4 Shaw, SW NE NE sec. 35-36n-2w. Spdg. 60 ft.
Eagle Pet. Co. No. 1 Haugen, C SE NW sec. 12-35n-3w. Drlg. 640 ft.
S. F. Scotland No. 1 McNamar, C NE SW sec. 29-35n-3w. Cmtd. 6⅝-in. at 1,635 ft.

Yellowstone County

Western Dakota Oil Co. No. 1 Fox, CEL NW NE sec. 14-2n-23e. Drlg. 400 ft. in 15½-in. hole.
Broadview Dome Oil Co. No. 1, NE NE SW sec. 18-3n-23e. Spdg.

UTAH

Daggett County

Mountain Fuel Supply Co. No. 1 Lauzier, CNL NW NW sec. 27-3n-24e. Drlg. 2,431 ft. (C.D.)

Emery County

Standard Oil Co. of California and Continental Oil Co. No. 1-A Palm, C NW NW sec. 27-23s-11e. Drlg. 4,124 ft.

Grand County

Utah Southern Oil Co. No. 1 Hyde, SE NW NW sec. 33-22s-22e. S.D. 6,715 ft.; M.I. heavier rot. equip.
Columbia Crude Corp. No. 1 Rath, NW SW SE sec. 12-25s-20e. Drlg. 2,265 ft.
Cane Creek Oil Co. No. 1 Govt., NW SW sec. 31-26n-21e. R.U.R.

NEBRASKA

Sioux County

J. M. Huber Corp. and United Producers, Inc., No. 1 Morgan, C SW SW sec. 32-35n-56e. Drlg. 2,761 ft.

Dawes County

Stephens Oil Corp. No. 1 Palmer, C NW SW sec. 1-33n-50w. Drlg. 2,418 ft.

Lincoln County

Smith & Wright No. 1 Hansen, C SW NW sec. 24-15n-31w. S.D. below 1,700 ft. to adj. titles.

A. J. Armstrong, Mexico City, for the past 15 years secretary of the Association of Producers of Petroleum in Mexico, has resigned to become vice president in charge of oil field production for the Texas Steel Company, Fort Worth, Tex.

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Texas and Louisiana Gulf

CONROE SAND PRODUCTION, SEGNO FIELD, POLK COUNTY

By
F. L. SINGLETON

HOUSTON, Tex., May 31.—The most important development along the Gulf Coast in the past week was the discovery of commercial production from the Conroe sand in an outpost 1¼ miles southwest of the Segno field in southern Polk County. The completion of the well apparently marks the beginning of an active drilling campaign, and the possibilities of a major field being developed are favorable.

The extension and new sand was opened by Humble Oil & Refining Co. No. 3-B Kirby Lumber Co., in the Marcell Victor Survey. Sand showing oil was topped at 5,340 feet and was cored 2 feet to a total depth of 5,342 feet where a 12-minute drill stem test at 5,300-42 feet showed 1,600 feet of 36-gravity oil and 50 pounds of pressure. The well was then tested through the drill stem and it flowed 21 bbls. of oil per hour through a quarter-inch choke. Tubing will be run for a final completion test.

Segno was discovered late in December, 1936, and all production to date has been from the Upper Cockfield horizon, about 100 feet below the top of the section which lies slightly below 5,100 feet. The producing limits of the field were believed to have been confined to a comparatively small area due to the recent abandonment of Humble Oil & Refining Co. No. 1 Kirby, due north of No. 3-B. No. 1 made a test of the upper and lower sections, and showed salt water.

Whether this lower sand will be found in the field proper can be only ascertained by deeper exploration. However, preparations are being made by J. K. Dorrance to test No. 4 Wing, after 4 feet of oil sand was recovered in a core at 5,228-47 feet, total depth. Seven-inch casing has been cemented on bottom. The test is 450 feet from the west line and 250 feet from the south line of a 10-acre lease in the I.&G.N. Survey No. 15.

There were three producers completed in the discovery horizon. J. K. Dorrance No. 1 Sarah Wing flowed 434 bbls. per day through a quarter-inch choke, with tubing pressure 600 pounds and casing pressure 1,650 pounds. LaQuinta Oil Co. No. 2 Wing was completed at 5,194 feet and flowed 18 bbls. per hour through a quarter-inch choke, while Rajo Oil Corp. No. 1 Wing flowed 145 bbls. per day through a quarter-inch choke with tubing pressure 1,700 pounds and casing pressure 1,750 pounds. Total depth is 5,198 feet.

Dry Gas in Katy Area

In the Katy area, southeastern Waller County, Stanolind Oil & Gas Co. No. 1 Hargrave, 1 mile southeast of the same company's No. 1 Thorpe, completed a few years ago for a wet gasser, has been completed and is now shut in after flowing dry gas through a quarter-inch choke with tubing pressure 1,600 pounds and casing pressure 1,000 pounds. Shut-in tubing and casing pressure is 2,675 pounds and 2,550 pounds respectively. Production is from the Upper Saline Bayou horizon from a screen setting made at 7,295-7,300 feet. Total depth is 7,500 feet. Location is in the T. S. Reese Survey.

C. B. Bunte and others No. 1 Fite, a north offset to the discovery well of the Sandy Point field, Brazoria County, was completed through perforated casing at 6,467-75 feet and is flowing distillate and some wash water through a one-eighth inch choke with tubing pressure 2,000 pounds and casing pressure 1,856 pounds. The discovery well was a small oil well, completed through perforations at 6,489-6,501 feet. One and a half miles southeast of the discovery well, Bunte Oil & Gas Co. No. 1 A. S. Sharp, is shut down at 6,564 feet after the surface casing collapsed. The Marginulina was topped at 6,343 feet and is checking over 100 feet lower than in the discovery.

In the same county, but in the Lockridge field, Gulf Oil Corp. No. 1-A G. L. Wood and others flowed 297 bbls. of pipe line oil per hour through a quarter-inch choke, with tubing pressure 300 pounds and casing pressure 600 pounds. Production was obtained by perforating the casing at 6,364-69 feet. This extends the field about a mile southwest. However production is not expected to be extended much further in this direction as the well is definitely near the water level. On the east side, production was defined by the failure of Shell Petroleum Corp. No. 3 Ramsey State Prison Farm, which was abandoned in salt water sand at 6,812 feet.

Chambers County

Salt Dome Oil Corp. was scheduled to make a drill stem test of No. 2-C Lawrence, Cotton Lake field, Chambers County, after coring sand with an oil odor to a total depth of 6,471 feet. The Discorbis was topped at 5,633 feet, Heterostegina at 5,951 feet and the Marginulina at 6,217-32 feet. In the same county, and located in the Ybarbo Survey, Sun Oil Co. made location for No. 1 Felix Jackson, a wildcat, 1,400 feet from the north line and 1,400 feet from the west line of the survey. It is a geophysical prospect and is expected to attract much attention. In the Seabreeze field, Sun Oil Co. No. 1-A Broussard is cleaning into the pit through a three-eighths inch choke showing tubing pressure 3,050 pounds and casing pressure 2,000 pounds. Production is from a screen setting at 8,380-8,450 feet which is the same pay as the discovery well. Location is in section 127, T.&N.O. Survey.

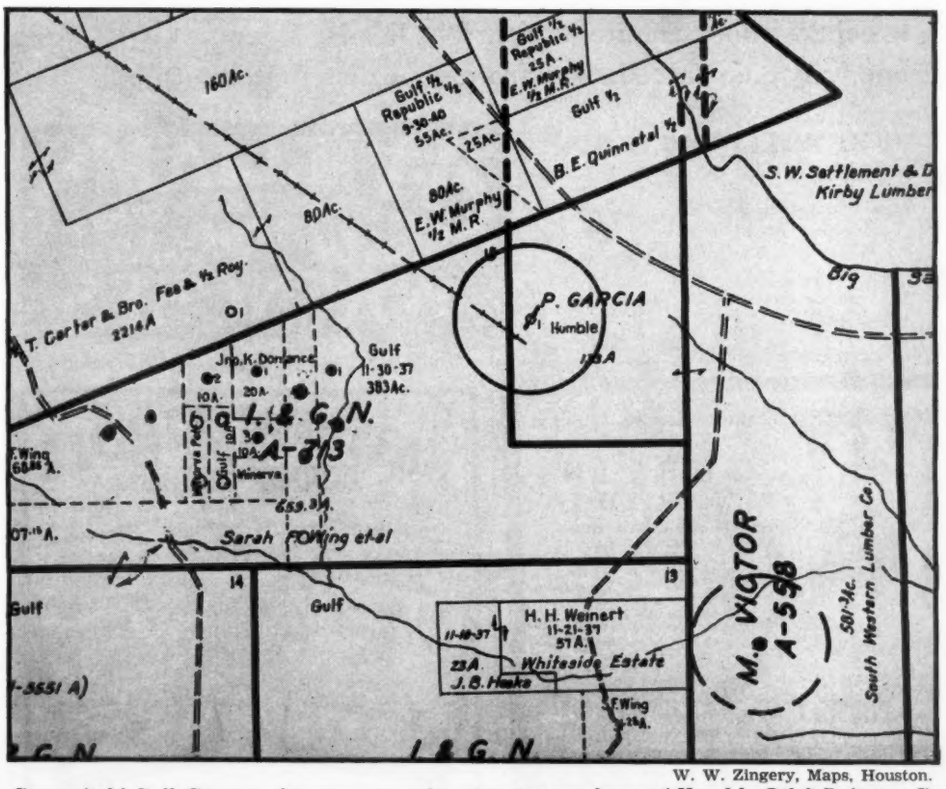
The largest producer yet completed by Republic Production Co. and Houston Oil Co. is No. 15 Brooks which flowed 1,082 bbls. of pipe line oil per day through a quarter-inch choke with tubing pressure 300 pounds and casing pressure 750 pounds. It is on the extreme southwest side of the field and is producing from the lower sand at 6,965 feet. Same company's No. 11 Brooks topped sand in a sidetracked hole at 6,953 feet and cored to 6,959 feet, the total depth. Seven-inch casing was cemented at 6,973 feet. Humble Oil & Refining Co. is moving in material for No. 1 M. L. Kirby on the southwest side of the field.

South of Amelia

South of the Amelia field, on the Cheek Prospect, Jefferson County, Magnolia Petroleum Co. No. 1 J. H. Phelan has been plugged back from a total depth of 8,575 feet to 8,548 feet and casing is being run, preparatory to testing a sand shown on a Schlumberger survey at 8,350-8,460 feet. Location is in the T.&N.O. Survey No. 14.

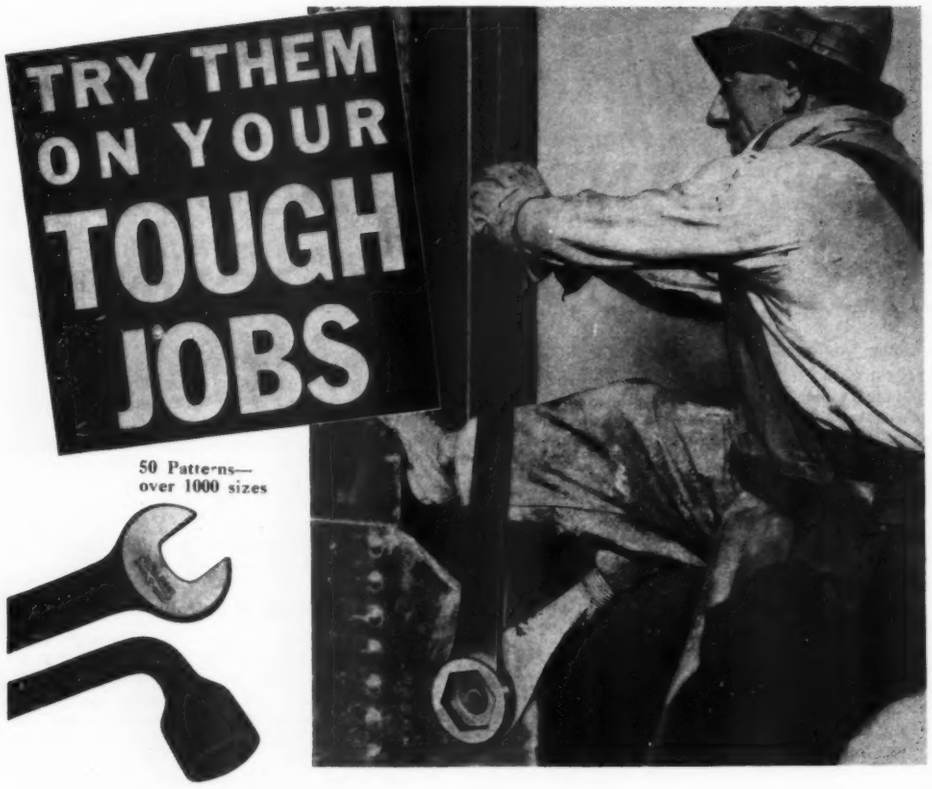
To the north in the West Beaumont field, Glenn H. McCarthy No. 5 Longe flowed 53 bbls. of oil per day through a 11/64-inch choke at a total depth of 5,411 feet. In the adjoining tract, Stanolind Oil & Gas Co. No. 1 W. P. McCormick flowed 332 bbls. per day through a quarter-inch choke from a screen setting at 5,350-85 feet, the total depth. Same company's No. 2 Sargl is preparing to test a new sand at a plugged back depth of 6,020 feet. On a drill stem test through perforations at 5,982-86 feet, it showed 270 feet of pipe line oil.

Offsetting the discovery well of the Ganado field, Jackson County, Texas Co. No. 1 Hultoquest, D. Dempsey Survey, made a 10-minute drill stem test at 5,100-



W. W. Zingery, Maps, Houston.

Segno field, Polk County, showing one-mile extension producer of Humble Oil & Refining Co. No. 3-B Kirby (indicated by broken circle), which is producing from the Conroe sand at 5,342 feet. A recent dry hole to the northwest is shown



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10½ feet and it showed 650 feet of fluid, of which 50 per cent was salt water, and the balance mud, sand and wash water. The hole is bottomed at 5,140 feet. Seven-inch casing was cemented at 5,108 feet.

In the New Ulm area of Austin County, Cockburn Oil Corp. and others were running a Schlumberger survey in No. 1 Henry Foerster. The hole is bottomed at 3,743 feet after having topped the Cockfield section at 3,567 feet. Sand with a gas show was cored at 2,538-45 feet and shale with streaks of sand with an odor of oil and gas at 3,695-98 feet. A core was taken at 3,698-3,707 feet, but no recovery was made. Location is in the A. J. Bell Survey.

Louisiana Coastal Fields

Along the Louisiana Coast, Humble Oil & Refining Co. No. 1 Ellender, in Terrebonne Parish, Louisiana, the world's deepest producer, with pay at 11,610-15 feet, continues to flow at the rate of 713 bbls. of pipe line oil per day through a quarter-inch choke with tubing pressure 3,300 pounds and shut-in casing pressure 4,400 pounds. It has a gas-oil ratio of 2,710 to 1. Gravity of the oil has been corrected to 40 degrees.

Union Sulphur Co. No. 1 Hebert which recently opened the first oil production in the Big Lake field, Cameron Parish, Louisiana, flowed 330 bbls. of fluid per day through chokes varying from a 14/64- to 18/64-inch, with tubing pressure from 925 to 1,050 pounds. The well is making 8 per cent salt water which is believed to be from a bad cement job, as the well flowed pipe line oil without water for the first three hours during the 24-hour period. Location has been made for the company's No. 1 Henry Hebert located 1,282 feet north and 2,577 feet west of the southeast corner of section 18-12-8w.

On the Pine Island Prospect, Jefferson Davis Parish, Louisiana Crusader Oil Co. cored sand and shale with a good gas odor at 7,892-7,917 feet. The hole is being reamed after salt water sand was cored at 8,043-97 feet. Location is in section 36-7s-5w.

In the Jennings field, Acadia Parish, two wells on the southwest flank were scheduled to be tested. W. T. Burton No. 1 J. J. Roboria, the most southerly well drilled, cemented 7-inch casing at 6,904 feet, and the casing is to be perforated at intervals from 6,513 to 6,971 feet. Superior Oil Co. No. 2 William Leckelt, section 42, topped sand at 6,600 feet and cored to 6,731 feet, the total depth and casing is being cemented for a production test.

On the Marchland Prospect, Lafourche Parish, William Helis No. 1 City of New Orleans perforated casing at 7,303-33 feet and on a drill stem test it showed 5,700 feet of salt water. A second test is being made through perforations at 7,270-80 feet.

Central West Fields

(Continued from Page 143)

tion 32, the same company completed another test on the Charles Hartong property. This test was completed in the same formation at 4,159-70 feet and gauged 789-000 feet of gas.

In Stark County, the East Ohio Gas Co. No. 2 C. H. Rudy, in section 9, Jackson Township, gauged 942,000 feet of gas naturally from the Clinton sand at 4,229-64 feet.

In Lorain County, Lot 57, Columbia Township, the Kemrow Co. has abandoned the test on the M. J. Osborn property as a dry hole. This test was drilled through the Clinton sand at 2,696-2,706 feet. In Lot 57 Grafton Township, Ohio Fuel Gas Co. completed a gas well on the Evelyn Burrer farm, in the Clinton sand at 2,574-80 feet.

In the Huron County gas field, section 8, Hartland Township, Leathers & Co. No. 1 E. M. Burras made 15,000 feet of gas after a shot in the lime at 812 feet and will be drilled deeper.

In Knox County, section 4, Union Township, Upham Gas Co. No. 4 Warren Farmer was drilled through the sand at 2,863-2,907 feet and abandoned as dry. In sections 3 and 4, same township, Upham Gas Co. is moving in for the second test on the G. Hammond farm. In section 4, H. E. Perkins is moving a rig on the L. Crockers farm.

A. D. Townsend No. 2 Jacob Niggermeyer, in section 11, Lodi Township, Athens County, was drilled through the first Berea at 1,627-37 feet, where it made 2 bbls. of oil naturally, through the second Berea at 1,680-94 feet, where it made 60,000 feet of gas naturally. The test was shot with 25 quarts and is being cleaned out. In section 17, same township, Ohio Fuel Gas Co. has staked a location for a test on the Floyd Hartley property.

North Louisiana, Arkansas

SCHULER FIELD, ARKANSAS, HAS HIGH-GRAVITY GUSHER

By MITCHELL TUCKER

SHREVEPORT, La., May 31.—The most important development in the Tex-La-Ark area last week was the completion of the second producer in the recently discovered Schuler field in Union County, Arkansas, 8 miles southwest of El Dorado, flowing 940 bbls. of 43-gravity oil in 13 hours on initial test from the Morgan sand, a lower member of the Travis Peak, at 5,660 feet. Two other offsetting wells were coring sand as the week closed, all of which strengthened the opinion that Schuler will prove to be one of the major discoveries of 1937.

Of particular importance in the Rodessa field was the discovery of gas in the Pettit lime at 6,525 feet, approximately 500 feet deeper than the present producing level in the Lower Glen Rose. New locations in the 12-mile semiproven extension of the field into Marion County, Texas, also added to the current developments of this field.

June Allowable for Louisiana

The greatest daily allowable oil production in the history of the state was set by the Louisiana Department of Conservation recently for the month of June. Approving a daily increase of 13,750 bbls, the total allowable will be increased to 254,650 bbls. per day. A daily production of 175,850 bbls. was allocated to South Louisiana fields, representing a daily increase of 8,450 bbls. over May. North Louisiana fields were allowed 78,800 bbls. daily, or an increase of 5,300 bbls., all of which was granted to care for new completions in the fast developing Lisbon field of Claiborne Parish.

An all-time high for drilling permits issued by the Louisiana commission was made in the month of May, when 131 new wells were approved.

Rodessa

To the United Gas Public Service Co., discoverers of the Rodessa field about two years ago, goes the credit for again discovering production there, this time in a deeper horizon. Its No. 1 J. W. Land, R. Potter Survey in Cass County, Texas, was drilled to a total depth of 7,255 feet as an exploratory test of the Pettit lime and Upper Travis Peak. Finding the latter zone nonproductive, the hole was plugged back to 6,533 feet and 7-inch casing perforated with 30 shots at 6,520-6,525 feet opposite the Pettit lime (basal Glen Rose). On initial test this well tested about 8,000,000 feet of gas, carrying considerable distillate, with casing and tubing pressure at 2,000 pounds. The well is now shut in.

Attention is again directed to the northeastern edge of the field, about 1½ miles west of Ida, La., where Drillers, Inc., No. 1 Glassell-Means, SW NE SE section 9-23-15, cored saturated Oolitic Young lime from 6,066-73 feet, set 7-inch at 6,064 feet, and are preparing to make initial test.

The Louisiana Department of Conservation has issued the per well allowables for June in that portion of the Rodessa field, which is allocated 50,000 bbls. daily. Only 47,692 bbls. were apportioned to present producers, the remainder being held in reserve for new completions. A total oil producing acreage of 6,907.2 was used to arrive at the 50 per cent acreage proration base, granting to each productive acre 4.7776 bbls. daily production. The 50 per cent bottom-hole pressure grant is made upon an aggregate pressure of 507,504 pounds for all oil producers, or .0650 bbls. allowed production per pound bottom-hole pressure.

Rodessa Completions

Two new completions were recorded on the Louisiana side of Rodessa, having an aggregate initial production of 774 bbls., and bringing total producers for that side of the field to 376 wells. In the Texas side of the field five wells were completed, with total initial of 2,047 bbls., and bringing total producers to 290 wells.

Arkansas-Louisiana Gas Co. completed No. 1 George, William R. Myers Survey, south of the gas-oil contact point, as a 96,942,975-foot gasser, 2,290 pounds rock pressure, total depth 5,980 feet.

The Hunter Co. No. 1 Fonda, A. D. S. Coy Survey, Marion County, Texas, 8½-mile extension of production along the Rodessa-Jefferson fault series, made official Railroad Commission gauge last week, flowing 230 bbls. of oil through seven-sixteenths inch tubing choke, with gas-oil ratio of 635 to 1.

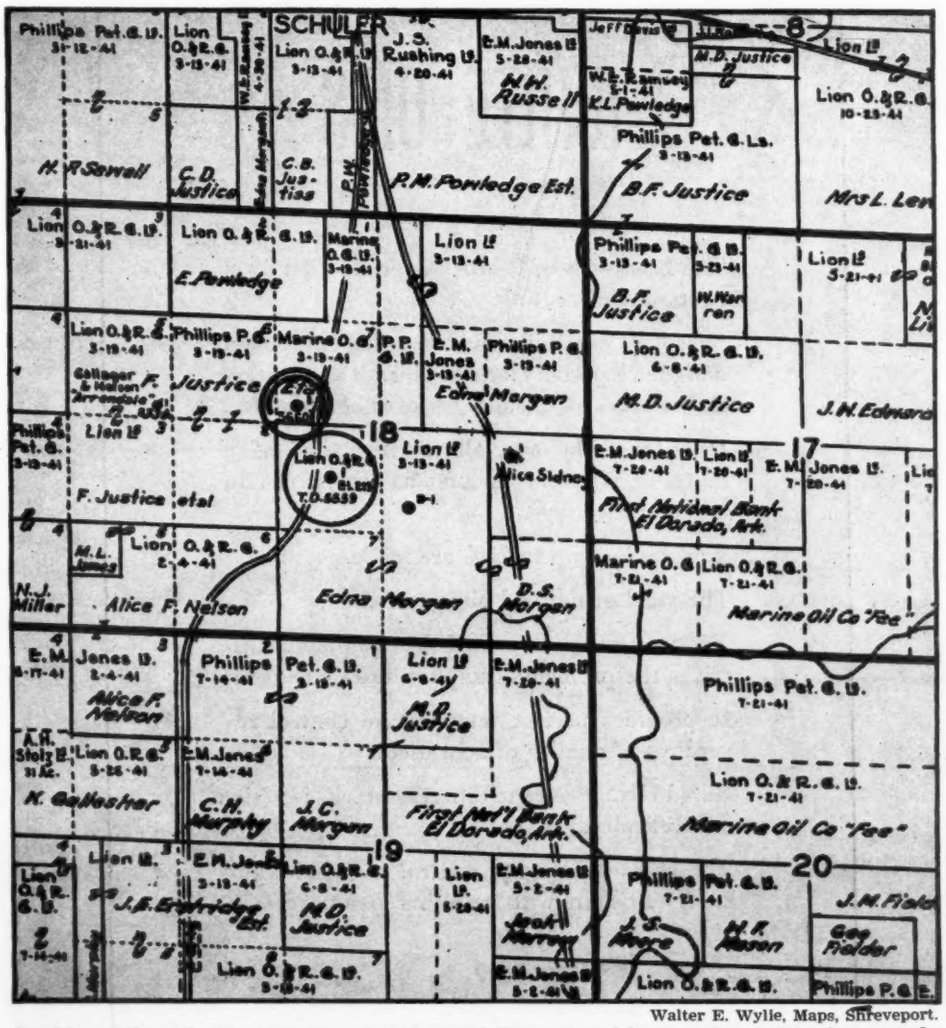
Four wells were immediately staked surrounding this extension well, all of which are now rigging up. One well each is to be drilled here by Arkansas-Louisiana Gas Co., Fohs Oil Co., the Hunter Co., and United Production Co.

Arkansas-Louisiana Gas Co. No. 1 C. C. Braden, T. Hanson Survey, east of the town of Jefferson where a 12-mile extension well was completed about three months ago, drilled the massive anhydrite from 5,432-5,687 feet and is checking about 70 feet higher than the discovery outpost. The Gulf Production Co., Mid-Continent Petroleum Co., Shell Petroleum, and Holcomb-Thomason Co. all plan tests here in the immediate future.

Bienville Parish

The Hunt Oil Co. and Seaboard Oil Co. No. 1 Bodcaw Lumber Co., SE section 30-14-5, Bienville Parish, is attracting wide attention as rigging up is about completed for drilling of a Lower Glen Rose test. This test is on the southeast flank of the Protho Salt dome, east of Saline Bayou. The location has been checked and rechecked by seismograph crews, and has been examined with a "fault-finding machine." American-Maracaibo and Gulf Refining Co. both have blocks nearby.

The Seaboard Oil Co., owner of the Bear Creek area of Bienville Parish, centering around section 3-16-6,



Walter E. Wylie, Maps, Shreveport.

Double circle indicates location of Arkansas' deepest and largest present producer in the newly discovered Schuler field 14 miles southwest of El Dorado, Ark. Marine Oil Co. No. 1 Justiss flowed 940 bbls. of 43-gravity oil during 13-hour initial test. Single circle indicates location of Lion Oil Refining Co.'s discovery well, flowing about 300 bbls. daily

on which it recently discovered gas and distillate production in No. 1 McGee, is expected to move in rig for drilling of No. 2 soon, and possibly No. 3. Royalty owners recently blocked a movement to unitize this field.

Bossier Parish

As a routine completion in the Bellevue field, Premier Investment Co. No. 41 Wyche, SE NW NW section 14-19-11, pumped 10 bbls. daily from the Nacatoch sand, total depth 243 feet.

Tidwell and others No. 1 Natting, section 15-22-14, wildcat test, has been abandoned as dry, total depth 2,954 feet.

Claiborne Parish—Lisbon Field

Allocation at Lisbon is now upon a 75 per cent acreage and 25 per cent bottom-hole pressure basis. The recent June order considers 398.7 acres productive and grants 11.851 bbls. daily allowable to each productive acre. Total bottom-hole pressure equals 37,674 pounds, allowing .04181 bbls. allowable for each pound pressure. A 2,000 to 1 gas-limit factor is also injected into the Lisbon allocation formula, but no wells there have a ratio in excess of this figure.

Lisbon Oil Co. No. 1 Burgess, section 3-20-5, about 3 miles west of production, recently temporarily abandoned in basal Glen Rose, will be reopened, cleaned out, acidized, and all reported showings thoroughly tested. If unsuccessful in this attempt, drilling will be carried deeper for a test of the Travis Peak.

Lisbon Completions

L. O. McMillan No. 1-B Maggie Patton, section 31-21-4, flowed 284 bbls. in 12 hours on initial test through 19/64-inch tubing choke, after a 3,000-gallon acid charge, total depth 5,301 feet.

J. C. Tippett No. 1 H. E. Patton, SW SE NW section 36-21-5, flowed 50 bbls. hourly through one-half inch tubing choke after a 3,000-gallon acid charge, to make the best producer in the field from total depth of 5,318 feet.

J. B. Bond No. 2 H. E. Patton, E half NW NW section 36-21-5, flowed 15 bbls. hourly through one-half inch tubing choke, 3,000 gallons of acid, total depth 5,290 feet.

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Lyons & Neely No. 1 W. H. Patton, N half NW NW section 6-20-4, flowed 24 bbls. hourly on initial test after acidizing with 3,000 gallons of acid, total depth 5,342 feet.

DeSoto Parish

Superior Oil Co. of Oklahoma has taken over operation of the Perla Oil Corp. No. 1 Joyner, SE NW SW section 28-11-12, temporarily abandoned at 3,300 feet for several months. It is the plan to test showings of oil previously logged here, and if nonproductive, carry the test to at least 5,000 feet. Steel derrick has been moved on location, and rigging up operations are underway.

Lincoln Parish

Considerable interest is being evidenced in Glassell & Glassell No. 1 Gray, wildcat test of the Dubach structure in the SE of section 16-20-3w, about 8 miles due east of the active Lisbon field. Massive anhydrite was drilled here from 3,880 to 4,101 feet, checking about 12 feet higher than the nearest Lisbon producer.

Natchitoches Parish

J. T. Lent No. 1 Locke, NE SE SW of section 26-9-9, on a 4,000-acre block about 20 miles east of the Converse field, logged a showing of gas in the Saratoga at about 2,460 feet, and is continuing drilling to the contract depth of 3,500 feet. A Glen Rose test may be made here if upper formations prove nonproductive.

Estimated Daily Production

Estimated daily gross production all companies week ending May 28, 1937:

NORTH LOUISIANA

Bellevue	800
Caddo light	3,995
Caddo heavy	2,430
Converse	800
Cotton Valley heavy	275
Cotton valley light	*1,635
DeSoto and Red River	1,490
Elm Grove	385
Haynesville	3,360
Holly	125
Homer	2,540
Lisbon	6,810
Pleasant Hill	130
Rodessa	49,575
Sarepta-Carterville	405
Sligo	355
Urania	2,825
Zwolle	800
Total	78,735

SOUTH ARKANSAS

Champagnolle	1,550
El Dorado	2,050
Lisbon	280
Miller County	530
Nevada	760
Schuler	290
Smackover light	2,170
Smackover heavy	17,075
Stephens	570
Troy	550
Urbana	1,325
Total	27,150

Texas side of Rodessa field—42,300 bbls. daily.

*1,150 bbls. is distillate.

Red River Parish

F. G. Gellz No. 1 Teekell, SW SE section 34-13-10, has been abandoned as dry at a total depth of 1,027 feet.

As a routine completion in the Bull Bayou field, Gulf Refining Co. No. 27 Kennedy, SW section 24-13-11, pumped 63 bbls. daily from total depth of 2,553 feet.

Rapides Parish

Increasing activity is reported in Rapides Parish of Central Louisiana. Five miles west of Boyce a new wildcat has been spudded by F. W. Martin & Co. in section 24-5-4w, upon a 1,000-acre block, situated about 50 feet from a well drilled in 1917 where a show of oil was logged at about 2,100 feet.

In northeast Rapides Parish, C. L. Decker and others of Houston have set surface casing for No. 1 Lee Lumber Co. in section 21-5n-3e, on an 8,000-acre spread, having the Lower Glen Rose as their objective.

Eight miles west of Alexandria, R. B. Webb and others No. 1 Brasher, section 22-4-2w, continued to fish for drill pipe at total depth 5,255 feet in their proposed 6,000-foot operation.

Sabine Parish

The Kirk-Green-Way No. 1 Whitney Corp., NW NE section 8-9-13, second deep test of the Converse shallow structure, has reached contract depth of 5,707 feet and is shut down. Gas was logged from 5,290 feet to 5,310 feet, and was the only attractive showing drilled through the Glen Rose formation. Negotiations are now

(Continued on Page 178)

Oklahoma Operations

By
OAL DALRYMPLE

DEEP PAY SOUGHT AT TESTS IN CARTER, COAL COUNTIES

The search for Ordovician production in southern Oklahoma was extended when Shell Petroleum Corp. began work at a deep test near the shallow Brock field in Carter County. It is the No. 1 Smith, NW SE NE section 30-5s-1e, on a block of 4,200 acres. Operators plan to drill to 5,500 feet to test both Pennsylvanian and Ordovician horizons. Production in the Brock field is from Pennsylvania sandstones at around 1,100 to 1,400 feet.

A second attempt to find production on the big structure in the Centrahoma area, Coal County, is to be made by Carter Oil Co. at No. 1 Clayton, C W half NE SW section 27-2n-9, on a 1,028-acre community block. It will seek deep pay horizons. The first deep test on the structure, Carter Oil Co. and others No. 1 Thompson, C S half NE NW section 34-2n-9, was temporarily abandoned at 7,125 feet about a year ago, but work recently was resumed and the well was showing about 200,000 feet of gas as the crew bailed at around 6,250 feet. It will test upper zones in which showings of oil were found.

E. A. DeBolt and associates appeared to be opening a new pool in the shallow district of Kiowa County at No. 1 Burnett, NE section 30-7n-20w, east of the Granite pool in Greer County. It had Granite Wash at 952-70 feet and bailed considerable free oil from total depth of 982 feet. Operators estimated it good for 50 bbls. of oil daily, with about 1,000,000 feet of gas. Another Kiowa County wildcat, Principle Oil Co. No. 1 Schierloh, SE NE SE section 28-7n-20w, was shut in prior to testing. It gauged around 11,500,000 feet of gas at 964-1,016 feet and had considerable oil in the hole at 1,024 feet, total depth.

Oklahoma allowable production for June was set at 625,300 bbls. daily by the Corporation Commission, in accordance with the Bureau of Mines estimate. This is an increase of 2,600 bbls. over the May allowable.

Pontotoc County

One of the larger wells completed in the Fitts field, Pontotoc County, the past week was E. H. Moore No. 2 Ingram, SW NE NE section 22-2n-7. It made potential of 4,027 bbls. of oil from Hunton lime at 3,870 feet, total depth 3,898 feet. Gas gauged 3,300,000 feet. Bottom-hole pressure was 1,462 pounds.

E. H. Moore No. 14 Akers, NW SE NE section 36-2-6, topped Hunton lime at 3,402 feet, Sylvan shale 3,702 feet, was acidized, flowed 265 bbls. of oil in 30 minutes gross, making potential of 2,195 bbls. Same operator's No. 2-B Harper, SE SW NE section 29-2-7, had Hunton lime at 3,336 feet, Sylvan shale 3,604 feet, total depth 3,610 feet, acidized, flowed 255 bbls. of oil gross in 30 minutes and made potential of 1,110 bbls. of oil. Same operator's No. 1 Thompson, NW SE SE section 33-2-7, flowed 471 bbls. of oil gross in eight hours after acid treatment and flowed 286 bbls. net through tubing in the next 24 hours. Top of Hunton lime was 3,800 feet; Sylvan shale 4,115 feet; total depth 4,127 feet. The No. 3-B Harper, NE SW NE section 29-2-7, found Cromwell sand at 2,555 feet, was bottomed at 2,690 feet, flowed 35 bbls. of oil in seven hours on gas lift and later flowed 67 bbls. in 23 hours through casing and tubing. E. H. Moore and others No. 1 Waite, NW cor. section 8-2-7, was completed as a water disposal well at 2,315 feet, total depth.

Skelly Oil Co. and Phillips Petroleum Co. No. 1 Metropolitan Life C, SE NW SE section 23-2-7, found Hunton lime at 3,614 feet, Sylvan shale 4,015 feet, total depth 4,017 feet, was acidized and flowed 1,140 bbls. of oil gross in eight hours, making potential of 3,359 bbls.

Amerada Petroleum Corp. No. 7 Smith, NE SW NW section 28-2-7, flowed 554 bbls. of oil gross in one hour after acid treatment and made potential of 2,466 bbls. Hunton lime was topped at 3,310 feet, Sylvan shale 3,563 feet, total depth 3,568 feet.

Loual Drilling Co. and others No. 7 Harden, NE NW NW section 30-2-7, had Bromide at 4,295 feet, was bottomed at 4,405 feet, acidized and made potential of 1,779 bbls. of oil.

Magnolia Petroleum Co. No. 1 Young, SE NE NW section 22-2-7, found Hunton lime at 3,882 feet, total depth 3,910 feet, flowed 333 bbls. of oil in two hours; acidized, flowed 667 bbls. of oil in 19 hours, cutting 4 per cent water, and made potential of 548 bbls. of oil.

E. H. Moore and Sinclair Prairie Oil Co. No. 1-A Woolley-Burris, C S half N half S half section 22-2-7, had Viola lime at 4,125 feet, Bromide 4,387 feet, total depth 4,391 feet, was acidized and made potential of 473 bbls. of oil.

First reports of new activity in Pontotoc County: Burke-Greis Oil Co. No. 8 Chambers, NE NE NW section 36-2-6, building rig; Navarro Oil Co. No. 4 Horn, SE NE NE section 22-2-7, location; Shell Petroleum Corp. No. 1 McKinley, SW SW NE section 23-2-7, cellar and pits; Phillips Petroleum Co. No. 5 Bates, NW SE NW section 26-2-7, cellar and pits; Magnolia Petroleum Co. No. 15 Burris A, SE SW NW section 27-2-7, rigging up rotary; Amerada Petroleum Corp. No. 9 Smith, NE SW NW section 28-2-7, drilling at 805 feet; Bishop Oil Co. No. 1-B Simpson, NW SW NW section 28-2-7, cellar and pits; Stahl Petroleum Co. No. 1-C Dennis, SW NE NW section 28-2-7, building rig; Loual Drilling Co. and others No. 7-A Harden, NE NW NW section 30-2-7, building rig; E. H. Moore No. 1 Scott Brown, NE SE SE section 33-2-7, cellar and pits; Mary F. Oil Co. and others No. 5 Miller, NW NE SE section 16-5-8, spudded; Larson and others No. 3 Robinson, SE SW NW SW section 23-5-8, drilling at 212 feet.

Okfuskee County

Six wells were completed in the Olympic district, Okfuskee County. Rogers Oil & Gas Co. and others No. 1 School Land, SW cor. section 8-10-9, topped Senora sand at 1,860 feet, total depth 1,910 feet, was shot, swabbed 98 bbls. of oil and 20 bbls. of water in 24 hours, and pumped 45 bbls. of oil and 23 bbls. of water in 24 hours.

Sinclair Prairie Oil Co. No. 1 Cohee, NW SW NW section 19-10-9, had Senora sand at 1,886 feet, total depth 1,896 feet, was shot and swabbed 65 bbls. of oil and 10 bbls. of water in 24 hours. Same company's No. 5 Palmer, NW NE NW section 19-10-9, pumped 10 bbls. of oil and 50 bbls. of water in 24 hours after shot, from Senora sand at 1,910 feet, total depth 1,918 feet, plugged back to 1,915 feet.

Ark Royalty Co. No. 3 Brooks, NW NE SW section 18-10-9, found Senora sand at 1,859 feet, was bottomed at 1,892 feet, shot and pumped 35 bbls. of oil and 35 bbls. of water in 24 hours. Same company's No. 5 Brooks, NE SE SW section 18-10-9, topped Senora sand at 1,860 feet, total depth 1,902 feet, plugged back to 1,899 feet and pumped 65 bbls. of oil and 40 bbls. of water in 24 hours.

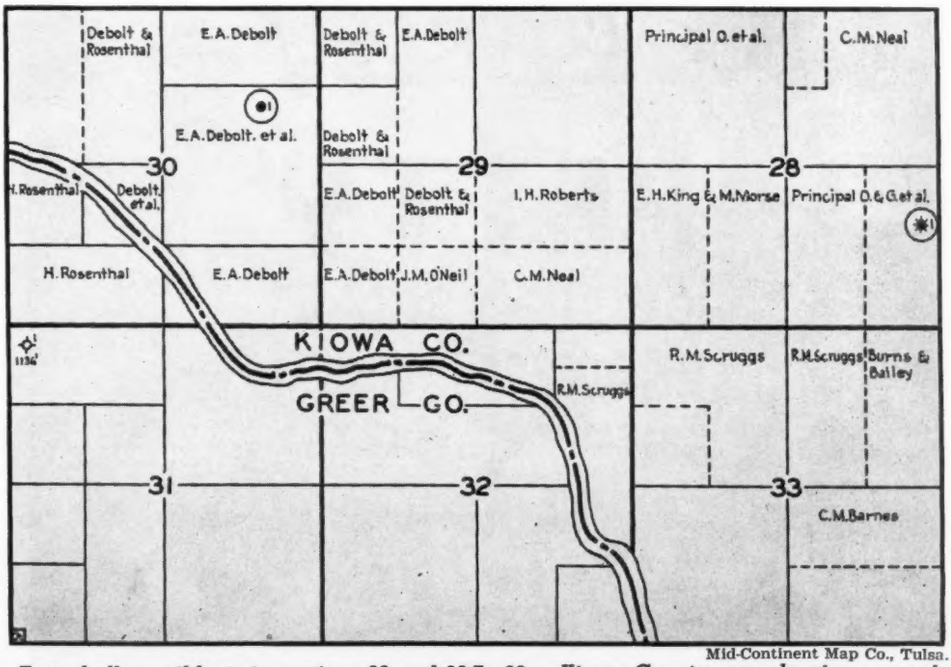
Champlin Refining Co. No. 2 Maudie, SW SE SW section 7-10-9, was shot and pumped 4 bbls. of oil and 13 bbls. of water in 24 hours from Senora sand topped at 1,857 feet, total depth 1,871 feet.

Snider & Swan No. 9 Wind, NE SW NE section 35-11-9, had sand at 1,440 feet, was bottomed at 1,487 feet, was shot and pumped 18 bbls. of oil in 24 hours.

The following new tests in Okfuskee County were reported: Ark Royalty Co. No. 6 Brooks, SE SE SW section 18-10-9, location; same company's No. 4 McIntosh, NW NW NE section 19-10-9, location; Sinclair Prairie Oil Co. No. 2 Cohee, SW SW NW section 19-10-9, drilling at 1,040 feet.

Seminole County

Amerada Petroleum Corp. and Stanolind Oil & Gas Co. No. 1 Reed, SE SW SE section 19-10-8, Seminole County wildcat, was dry and abandoned at 3,618 feet, total depth. Tops follow: Wewoka sand 1,230 feet; Calvin sand 2,030 feet; Senora sand 2,335 feet; Brown



Mid-Continent Map Co., Tulsa.

Two shallow wildcats in sections 28 and 30-7n-20w, Kiowa County, are showing as probable pool openers

lime 3,178 feet; Booch sand 3,320 feet; Wapanucka 3,569 feet; Cromwell 3,597 feet.

Scroggins No. 1 fee, SW NE SW section 34-7-6, was dry and abandoned at 850 feet, total depth.

Magnolia Petroleum Co. No. 2 Carolina, SW SW NW section 14-8-7, an old well, was deepened from 3,196 feet to 3,385 feet, had a junked hole and was abandoned. Sinclair Prairie Oil Co. No. 3 Paltman, SW SE NW section 18-9-6, an old well, had a hole full of mud after plugging back from 4,206 feet to 3,340 feet and ripping casing, and was abandoned.

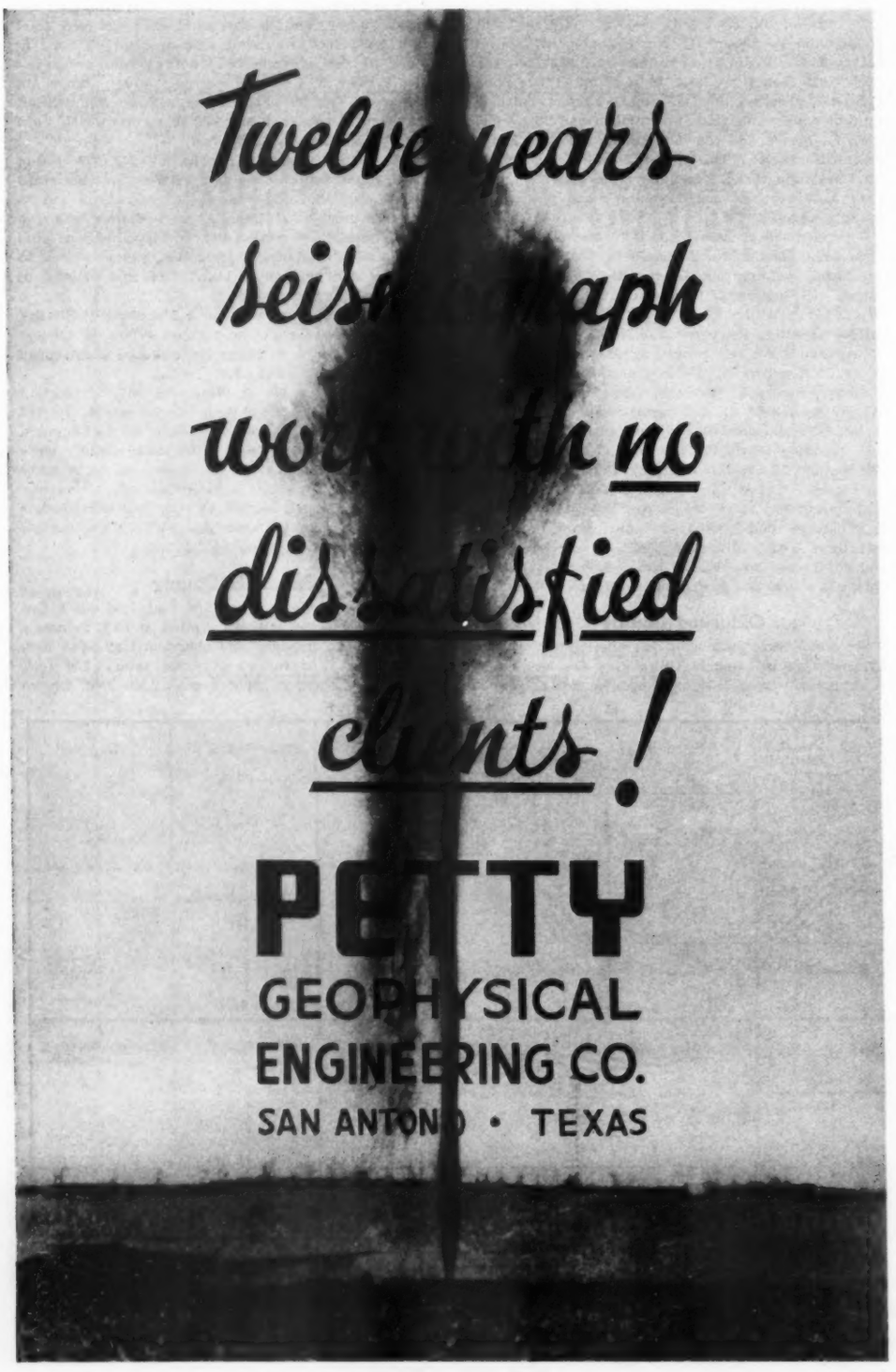
New work in Seminole County: Jack Lynch and others No. 1 Swan-Burton, NW NW NE section 24-5-5, rigging up rotary; Manahan Oil Co. No. 1 Williams, NE SW NE section 22-6-6, location; Paul Traugh No. 2 Williams, NW SE NE section 22-6-6, cellar and pits; same operator's No. 3 Williams, SE SE NE section 22-6-6, cellar and pits; Rudman and others No. 1 well, SW NE NW section 23-6-6, location; Winona and others No. 1 Harris, SW SE SE section 18-7-8, an old well, rigging up rotary to deepen; Seminole Oil & Gas Co. No. 1 Billington, NW section 22-8-7, cellar and pits; Texas Co. No. 1 Meadors, C NE NE section 8-8-10, an old well being deepened, fishing for bit; Amerada Petroleum Corp. and others No. 2 Noble, SW SW SE section 25-10-7, building rig; same operator's No. 3 McLarin, NW NW NE section 36-10-7, cellar and pits.

Pottawatomie County

E. W. Jones and others No. 1 Junk, NE SE NW section 5-10-4, Pottawatomie County, had Earlsboro sand at 4,419 feet and was dry and abandoned at 4,496 feet, total depth. Tom Phillips, Arrow Drilling Co. and others No. 1 Cassey, C W half SE NE section 23-11-6, an old well, had drill pipe stuck and was abandoned at 2,250 feet after plugging back from 4,620, old total depth.

Mid-Continent Petroleum Corp. No. 1-A Logan, NE NE SE section 31-11-5, wildcat, opened a new producing area in Pottawatomie County. It topped Wilcox sand at 4,839 feet, was bottomed at 4,844 feet, swabbed 125 bbls. of oil in 12 hours, was acidized and on completion test pumped 200 bbls. of oil and 80 bbls. of water in 24 hours.

Union Development Co. No. 1 Abbott, SW NW NE section 34-3-6, Pottawatomie County wildcat, was drilling at 250 feet. Arrow Drilling Co. and Kenrow Drilling Co. No. 1-A Cassey, C W half SE NE section 23-11-6, was drilling at 950 feet. Stanolind Oil & Gas Co. and Amerada Petroleum Corp. No. 3 U. R. Rushing, NE SW SE section 32-11-4, was a location. Ramsey Petroleum Co. No. 2 Johnson, SW NW SE section 9-3n-7, was drilling at 300 feet.



Estimated Daily Production

Estimated daily production of Oklahoma for the week ending May 29, and for the preceding week, was as follows:

	Barrels	
	May 29	May 22
Allen	5,775	6,000
Burbank	7,875	7,850
South Burbank	16,400	16,300
Balance Osage	22,300	22,200
Blackwell district	5,325	5,375
Bristow-Slick	7,725	7,750
Chandler	3,200	3,100
Crescent	12,125	11,375
Cromwell	3,600	3,500
Cushing-Shamrock	10,400	10,350
Duncan district	3,700	3,725
Edmond	21,200	19,650
Fish	5,900	5,725
Fitts	101,775	89,225
Jesse	3,950	2,950
Graham	4,775	4,750
Gray	1,375	1,150
Healdton	9,750	9,725
Hewitt	4,450	4,475
Holdenville	925	900
Keokuk	10,250	10,700
Lucien	14,300	14,350
Moore	13,100	12,750
Oklahoma City	165,275	169,525
Olympic	14,200	14,575
Papoose	925	900
Polo	1,475	1,500
Sasakwa and townsite	2,800	2,925
Sholem-Alechem	3,100	3,075
Seminole:		
Bowlegs	11,600	11,725
Carr City	5,850	5,900
Earlsboro	6,350	6,525
South Earlsboro	750	725
East Earlsboro	7,600	7,650
Little River	11,050	10,825
East Little River	1,125	1,175
Maud	800	825
Mission	2,275	2,425
Seminole	9,250	10,175
East Seminole	3,050	3,025
Searight	5,000	4,725
Total Seminole	64,700	65,700
St. Louis-Pearson	22,925	23,175
Tatums	5,150	5,175
Tonkawa-Garber-Thomas	9,950	9,900
Wewoka	3,250	3,225
Yale-Jennings	4,250	4,225
Other pools	72,600	71,950
Total Oklahoma	660,775	649,725

Noble County

The Billings field of Noble County gained two large producers the past week. Phillips Petroleum Co. and Shell Petroleum Corp. No. 2 Hackett, SW NE SE section 21-23-2w, had Wilcox sand at 4,311 feet, total depth 4,337 feet, flowed 2,492 bbls. of oil in seven hours and 35 minutes and made 24-hour potential of 4,074 bbls.

Tide Water Oil Co. No. 5 Hackett, SW NW SE section 21-23-2w, flowed 255 bbls. of oil in one hour and 30 minutes, making potential of 3,996 bbls. Production was from Wilcox sand topped at 4,300 feet, total depth 4,326 feet.

Logan County

The Texas Co. No. 5 Denny, NE NW SE section 33-17-4, Crescent pool, Logan County, found Hunton lime at 6,097 feet, Wilcox sand 6,204 feet, total depth 6,723 feet, with a hole full of water. It was plugged back to 6,250 feet, casing was perforated, it was acidized two times and flowed 7 bbls. of oil an hour on gas lift, cutting 20 per cent water.

Continental Oil Co. No. 6 McConnell, SW SW SE section 28-17-4w, topped Wilcox sand at 6,487 feet, total depth 6,574 feet, water intruded, it was plugged back to 6,155 feet and was dry and abandoned.

Osage County

Helmerich & Payne and others No. 1 Osage, NE NE SW section 13-23-6, Osage County wildcat, topped Big Lime at 2,290 feet, Oswego 2,430 feet, Pink lime 2,625 feet, Bartlesville sand 2,708 feet, Chat 2,800 feet with a hole full of water, Mississippi lime 2,823 feet, total depth 2,825 feet, where it was dry and abandoned.

Kewanee Oil & Gas Co. No. 2 Perkins, NE SE SW section 27-26-6, South Burbank area, had Bartlesville sand at 2,858-2,932 feet and was dry and abandoned at 2,951 feet, total depth.

Mason and others No. 3 Osage, SE SW NE section 23-21-8, an old well, was deepened from 2,229 feet to

Bartlesville sand at 2,250 feet and was dry and abandoned at 2,325 feet, total depth. Indian Territory Illuminating Oil Co. No. 382 Osage, SW SW SE section 34-27-11, an old well, was deepened from 1,850 feet to Arbuckle lime at 2,109 feet and was recompleted for 3,500,000 feet of gas at 2,115 feet, total depth.

Indian Territory Illuminating Oil Co. No. 5 Osage, SE SW SE section 17-23-10, was completed as a water disposal well at 612 feet, total depth.

New work in Osage County: Wolverine Oil Co. and others No. 19 North Avant Unit, NW NE SE section 31-24-12, drilling at 1,000 feet; same operator's No. 49 North Avant Unit, SE SE NE section 31-24-12, drilling at 495 feet; W. G. Ingersoll No. 8 Osage, SW section 14-24-9, location; Sinclair Prairie Oil Co. and Peters Petroleum Co. No. 16 Osage, NW SW NE section 24-24-7, location; H. C. Zeisman No. 2 Osage, SW NW SW section 26-27-11, location; Barnsdall Oil Co. No. 12 Osage, SW NW NW section 36-25-11, location; Phillips Petroleum Co. No. 19 Osage, NE SE SE section 14-25-11, location; same company's No. 62 Osage, NE SE NE section 21-25-12, location.

Hughes County

New operations in Hughes County included the following: H. H. Ellis No. 1 Tiger, NW SE SW section 20-6-8, rigging up machine; Phillips Petroleum Co. No. 2 Simon, NE NW SW section 5-7-8, an old well, rigging up standard tools; J. D. Hanna No. 1 Bunner, NE NW NE section 14-9-8, an old well, plugged back from 1,905 feet to 1,900 feet, shot and cleaning out; Midwest Production Co. No. 1 Hill, C SE NW section 13-9-9, an old well, rigging up standard tools to deepen; Amerada Petroleum Corp. and others No. 1 Chapman A, SE NW NW section 31-9-9, cellar and pits.

Lincoln County

Five new operations were reported in Lincoln County. Continental Oil Co. and others No. 1 Community, NE NE SW section 7-15-5, was a location. Sun Oil Co. No. 2 Aranwine, NW SW SE section 35-15-2e, was digging cellar; Phillips Petroleum Co. No. 1 Witmer, SW SE NE section 35-15-2e, location; same company's No. 1 Aranwine, SW NW SE section 35-15-2e, location; Mullendore No. 1 Keller, NW NE NW section 28,17-3, location.

Okmulgee County

R. E. Downing No. 6 Colbert, SW NE NE NE section 1-15-14, Okmulgee County, was dry and abandoned at 1,405 feet, total depth.

Devonian Oil Co. No. 5 Tiger, SW NW SW SW section 24-16-12, an old well, was deepened from 2,243 feet to 2,532 feet, total depth, produced 1,000,000 feet of gas and was recompleted.

New work in Okmulgee County: Blaise and others No. 1 Badger, C NE NW section 22-13-14, an old well being deepened, drilling at 1,916 feet; R. E. Downing No. 11-A Colbert, C SW NW section 1-15-14, location; Walter L. Dodge No. 7-A Almy, NW NW SW section 11-15-14, location.

Creek County

Dundee Pipe & Supply Co. No. 2 Beaver, C S half NW NE section 4-17-12, an old Creek County well, was deepened from 1,540 feet to Wilcox sand at 2,189-2,203 feet, total depth, plugged back to 1,550 feet and was dry and abandoned.

Tulsa County

S. W. Anthony No. 8 Wilcox, NE NE NW NW section 3-16-12, Tulsa County, had Wilcox sand at 2,282 feet, total depth 2,295 feet, was shot and pumped 30 bbls. of oil daily. Wheatley Brothers No. 2 fee, SE cor. section 4-19-12, produced 2,000,000 feet of gas from sand at 1,273-76 feet, total depth. Klingensmith and others No. 2-A Gilcrease, SW SE SW section 34-17-12, had Wilcox sand at 2,291 feet and was dry and abandoned at 2,294 feet, total depth.

Muskogee-Wagoner Counties

Three new operations in Muskogee County were: J. M. Foltz No. 2 Reddick, C E half SE NE section 20-13-16, an old well, cleaning out; M. S. Mussellem No. 3 Campbell, NW SE NW section 33-14-19, location; L. C. Butler & Roy Carney No. 4 James, NE SE SE section 18-14-17, machine.

In Wagoner County, A-Z Oil Co. No. 2-A Wallenstein, SE NW NW section 16-16-15, was a location.

Garvin County

Winkler & McQueen No. 3 Perkins, SW SW NE section 32-1n-3w, Tussy area, Garvin County, had broken shale lime at 2,261-87 feet and broken sand and shale at 2,311-23 feet, total depth 2,448 feet. It pumped 160 bbls. of oil, cutting 14 per cent water, the first 24 hours.

Cox & Hamon No. 2 Harris, SW SE NW was bottomed at 2,930 feet, shot casing at 2,195-2,230 feet and pumped 180 bbls. of oil in the first 24 hours.

Carter Oil Co. No. 1 Parton, NW SE NW section 33-1n-3w, was plugged back from 2,615 feet, total depth, to 2,290 feet and was completed as a 12-bbl. pumper, cutting 4 per cent water.

Cox & Hamon No. 3 Harris, SE SW NW section 32-1n-3w, was drilling at 1,470 feet.

Atoka County

A. J. Sanders No. 3 Redden, SE SW SW section 19-1n-5e, Atoka County wildcat, was dry and abandoned at 1,260 feet, total depth, when efforts to clean out the hole were unsuccessful.

Carter County

Carter Oil Co. No. 41 Ward, C S half NE NW section 6-4s-3w, Carter County, was completed as a 35-bbl. pumper at 1,140 feet, total depth. Shell Petroleum Corp. No. 48 McClure, SW SE NW section 5-4s-3w, was completed as a 16-bbl. pumper after plugging back to 990 feet from 1,172 feet, total depth. Carl Carter No. 1-A Gray, SE NE NE section 10-1s-3w, was dry and abandoned at 1,063 feet, total depth.

New operations in Carter County: Carl Carter No. 10 Harley, SW NW SW section 19-2s-3w, drilling at 270 feet; Schermerhorn Oil Co. No. 29 fee, SE SW NW section 5-4s-3w, an old well, rigging up machine to deepen; Shell Petroleum Corp. No. 51 McClure, NE NE SW section 5-4s-3w, location; Rockland No. 56 Sarasota, NW NW NE section 23-4s-3w, spudded.

Southwestern Oklahoma

H. J. Edwards No. 1 Frederick, NE SE NW section 31-2n-8w, Stephens County wildcat, had a show of oil and water at 2,716-54 feet, total depth, but was abandoned. Carl Carter No. 9 Harley, NE SE NE section 24-2s-4w, Stephens County, was completed as a 4-bbl. pumper at 432 feet, total depth.

In Jefferson County, Olson Drilling Co. and Heenan & Coe No. 1 Rose, C SW SW section 1-5s-5w, wildcat.

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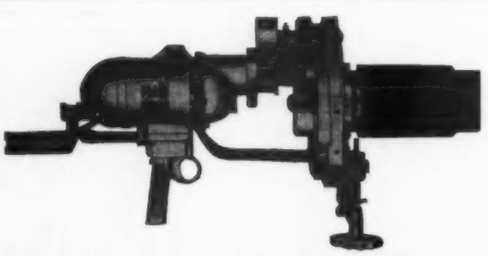

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had no showings and was dry and abandoned at 5,024 feet, total depth.

In Cotton County, Shasta Oil Co. No. 3 School Land, SW NE SW section 36-1s-10w, pumped 8 bbls. of oil in 24 hours at 2,180 feet, total depth. Same company's No. 4 School Land, SE NW SW section 36-1s-10w, was dry and abandoned at 2,245 feet, total depth. The company's No. 2 School Land, SE NW SW section 36-1s-10w, pumped 9 bbls. of oil in 24 hours and was completed in sand at 2,165-78 feet, total depth.

Lynn Oliver No. 1 Rilling, SE SE NW section 22-1s-15w, Tillman County wildcat, was dry and abandoned in Granite Wash at 1,387 feet, total depth.

In Greer County, Neff-Godfrey-Andrea No. 1 Melton, SE NW SE section 16-3n-22w, wildcat, topped Cisco formation at 3,440 feet and was dry and abandoned at 4,522 feet, total depth, in shale and shells.

Penn State Oil Co. No. 1 Cole, C W half SW NW section 21-2n-26w, wildcat in Harmon County, based Red Beds at 1,370 feet, topped Cisco formation at 3,625 feet, Cisco lime 3,915 feet and was dry and abandoned in shale and shells at 5,575 feet, total depth.

New work in Southwestern Oklahoma: Healdton Petroleum Co. No. 9 Jamerson, SE SE NW SE section 14-2s-4w, Stephens County, rigging up machine; Gulf Oil Corp. No. 1 Thomas, SW NW NW section 14-4n-5w, wildcat in Grady County, location; Ace Gutowsky No. 1 Lee, NW NW SE section 36-2n-19w, Jackson County wildcat, location; same operator's No. 1 Booker, NW cor. section 33-2n-18w, Jackson County wildcat, location.

Southwest Texas Fields

(Continued from Page 141)

Highland Oil Co. completed No. 1 Farias during the week for an initial production of 124 bbls. per day. The sand in this second well of the field was cored at 4,796-4.804 feet, and pressure of 780 pounds on the casing and 700 pounds on the tubing were recorded as the well flowed through a one-eighth inch choke. The Highland well extends production three-quarters of a mile northwest.

In the same field, four other tests are on the sand, and a fifth is approaching it. Benedum & Trees Oil Co. No. 1 Puig is washing in, indicating extension of production to the south, and Parr Oil Co. No. 1 Puig is also on the sand, completing. Frank Gravis, discoverer of the field, is on the sand with his second test, No. 2 Puig, and Smith & Storey were last reported coring saturated sand at 4,767 feet. The completions in the field are matched with new locations, with additional rigs being moved in for other tests, presaging considerable activity in that area for weeks to come.

Aransas County

Aransas County, interesting for two reasons, held the attention of many operators during the week. The Barnsdall Oil Co. No. 2 Kate Edwards has reached the crucial depth at which the offsetting No. 1 blew out and cratered. During the week a drill-stem test made at 7,545-8,029 feet showed gas. A second test made at 8,010-29 feet unloaded the 3,000-foot water cushion used to prevent a recurring blowout, and made in addition considerable salt water. No pressure was recorded in either test, due to the weight of the water cushion. Operators are now coring ahead below 8,080 feet.

The McCampbell field of the same county is showing much greater possibilities, as the new 7,110-foot sand develops. The field was discovered and first developed in the 6,550-foot sand, which is inferior to the second deeper horizon. The Landreth Producing Corp. completed No. 2 McCampbell during the week at 7,120 feet for an initial production of 373 bbls. per day.

East Texas Fields

(Continued from Page 144)

Upshur County

Ben G. Barnett No. 2 Phillips, 3,729-30 feet, 60 bbls. per hour. Harrison & Carter No. 1 Briggs, 3,760-64 feet, 5 bbls. per hour on pump. Monte Oil Co. No. 8 Smith, 3,702-20 feet, 5 bbls. per hour on swab. Papadakis No. 2 Knickerbacker, dry and abandoned 3,752 feet. P. H. Pewitt No. 7 Willeford, 3,728-29 feet, 30 bbls. per hour. Rogers and others No. 3 Jewel Evers, 3,862-74 feet, 15 bbls. per hour on pump. Rudco Oil & Gas Co. No. 7 Nicholson, 3,656-57 feet, 32 bbls. per hour. F. E. Hargraves No. 2 Brawley, 3,765-66 feet, 48 bbls. in six hours on pump. Sun Oil Co. No. 3 Crosley-Williams, dry and abandoned.

California Field Report

By L. P. STOCKMAN

WILMINGTON LARGE FACTOR IN STATE'S OVERPRODUCTION

LOS ANGELES, Calif., May 31.—The Central Committee of California Oil Producers, after a lengthy discussion, decided that conditions did not warrant increasing California's allowable crude oil production, and the state's quota for June will be the same as in May, 602,330 bbls., but, including the allowance for new wells will be 603,900 bbls. The substantial excess in production in May was undoubtedly an important factor in determining the daily quota for June. The Wilmington field of Los Angeles Basin, with a production of 23,000 bbls. per day in excess of its prescribed quota, was the largest contributor to the state's excess production of approximately 50,000 bbls. per day in May. The Lakeview section of the Midway-Sunset field showed an excess of approximately 7,000 bbls. per day, with Ventura Avenue, El Segundo, Huntington Beach, Long Beach and Santa Fe Springs exceeding their respective allowables by approximately 2,000 bbls. each.

The Central Committee was of the opinion that a substantial increase would be justified during July and August if the state's allowable for June was maintained at the rate that prevailed in May. During June, the Wilmington field, which has been producing as much crude oil as could be sold, will receive a daily quota of approximately 18,500 bbls. per day as compared with the May quota of 13,460 bbls. per day. The Wilmington field committee, of which William Reinhardt is chairman, is making a determined effort to secure the approval of every operator in the Wilmington field of a plan whereby all wells will be curtailed to an equitable allowable to be determined in accordance with the method of curtailment as applied in other fields throughout the state. In contrast with previous attempts to secure effective curtailment, the Central Commitee and the state umpire are maintaining a hands-off policy.

Wilmington

Twelve new wells were completed in the Wilmington field and the number of completions should be equally as large during the next several weeks. General Petroleum Corp., discoverer of the Wilmington field, bottomed No. 3 Ford at 5,355 feet and the hole is being reamed preparatory to landing casing.

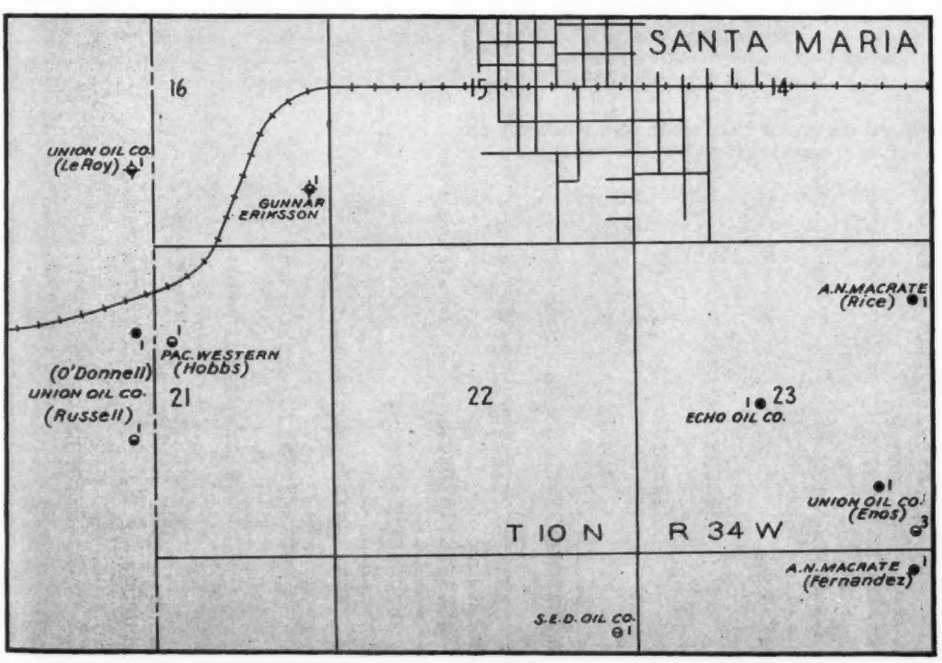
Sonwell Oil Co. extended the proven limits of the field two blocks northwest by completing No. 1 flowing 647 bbls. of 16.6 gravity oil per day from 3,595 feet after the hole had been finished with a 7-inch combination string. Completion of this new well will result in the drilling of four offsets by operators holding adjacent acreage. Union Pacific Railroad Co., which has just leased 31 acres of potential oil land from the Consolidated Lumber Co. east of Ford Avenue and running north to Anaheim road, completed two new wells on its own industrial property. Union Pacific Railroad Co. No. 6 Offset has been completed flowing 746 bbls. of clean 17.9 gravity oil daily from 3,535 feet, the 8⅝-inch carrying 657 feet of perforated and being cemented through perforations at 2,681 feet. Union Pacific Railroad Co. No. 11 was brought in flowing 996 bbls. of clean 24.4 gravity oil initially from 3,915 feet, and General Petroleum Corp. No. 7 was brought in flowing 1,420 bbls. of 25.6 gravity oil per day from 3,825 feet after the hole had been plugged back from 3,959 feet. Union Pacific No. 11 is producing from 373 feet of formation, while No. 7 Ford of General Petroleum has perforations in the 8⅝-inch at 3,102-3,560 feet and at 3,640-3,825 feet.

TANKER SHIPMENTS FROM LOS ANGELES TO DOMESTIC AND FOREIGN PORTS

	May 20		May 13			
	Total this week	Daily average	Total last week	Daily average	This year to date	Same time last year
Intercoastal-domestic:						
Diesel and gas oil	.....	.....	.....	.....	176,726	151,541
Gasoline	177,524	25,361	125,276	17,897	1,299,476	2,607,284
Kerosene	68,191	9,742	.....	.....	198,231	505,419
Foreign exports:						
Crude oil	199,760	28,537	165,888	23,698	5,106,481	3,802,223
Fuel oil	250,180	35,740	244,373	34,910	5,376,782	4,053,744
Diesel and gas oil	101,384	14,483	40,266	5,752	2,669,014	2,234,078
Gasoline	150,616	21,517	.....	.....	2,647,227	2,451,517
Kerosene	10,107	1,444	.....	.....	904,343	386,990
Other unfinished oil	.....	.....	112,346	16,049	402,700	16,894
Coastwise-domestic:						
Crude oil	276,621	39,517	100,108	14,301	2,595,029	2,810,814
Fuel oil	308,211	44,030	190,950	27,279	5,738,383	3,441,943
Diesel and gas oil	29,468	4,210	23,108	3,301	969,628	510,844
Gasoline	444,628	63,518	323,873	46,268	4,999,398	5,271,428
Kerosene	.....	.....	2,212	316	69,559	88,684

TANKER SHIPMENTS FROM SAN FRANCISCO TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic:						
Diesel and gas oil	.....	.....	.....	.....	152,932	.....
Gasoline	.....	.....	.....	.....	25,778	71,960
Asphalt	.....	.....	.....	.....	65,790	60,950
Lubricants	2,999	428	.....	.....	9,847	18,129
Foreign exports:						
Crude oil	71,759	10,251	.....	.....	1,129,153	1,115,528
Fuel oil	47,573	6,796	.....	.....	705,303	1,322,596
Diesel and gas oil	26,627	3,804	.....	.....	1,070,507	337,640
Gasoline	352,770	50,396	.....	.....	2,425,646	1,311,982
Kerosene	15,734	2,248	.....	.....	301,637	255,698
Lubricants	20,959	2,994	.....	.....	263,364	129,925
Coastwise-domestic:						
Fuel oil	242,432	34,633	62,831	8,976	2,396,310	2,963,123
Diesel and gas oil	17,118	2,445	29,609	4,230	280,247	231,077
Gasoline	72,814	10,402	198,480	28,354	1,736,390	1,999,852
Kerosene	5,986	855	.....	.....	72,094	58,932



Union Oil Co. recently discovered a new pool about 1 mile west of the Santa Maria Valley field, with its No. 1 Leroy. An important test is being drilled about 2 miles west of it by Cohn and Mitchell. The S.E.D. Oil Co.'s test in section 27 is also being closely watched

Aggressive Development

Royalty Service Corp. completed four new wells during the current week, which showed an aggregate initial daily production of 2,226 bbls. No. 7 Community flowed 430 bbls. of 16.7 gravity oil daily from 3,640 feet; No. 3-A Nelson 811 bbls. of relatively clean 16.9 gravity oil daily from 3,551 feet; No. 20-5-1, 465 bbls. of 16.7 gravity oil per day through a 36/64-inch bean from 3,575 feet, and No. 23-7-1 520 bbls. of 16.8 gravity oil through a 36/64-inch bean. The last named was bottomed at 3,620 feet and finished with a 6⅝-inch liner including 453 feet of perforated.

The General Petroleum Corp.'s Ford property, leased from the Ford Motor Co., in addition to being either on top of the structure or close to the apex, yields the highest gravity oil produced in this district. No. 7 Ford, completed a few days ago, is producing a crude oil testing 25.6 degrees, which is approximately 9 degrees higher than the gravity of crude produced by wells in the town lot area to the north. Holly Development Co. No. 1 Dominguez was completed a few days ago flowing 410 bbls. of 16.4 gravity oil daily from 3,581 feet, and Ring Oil Co. No. 3 Wilmington has been completed flowing 784 bbls. of clean 17.8 gravity oil per day from 3,605 feet. The latter company's No. 2 Wilmington, completed a few weeks ago, is still flowing 724 bbls. of ex-

ceptionally clean 17.7 gravity oil daily through a 16/64-inch bean from 3,610 feet. Interstate Investment Corp. drilled into bottom water in No. 1 Kibbe at 3,745 feet, but the hole was plugged back to 3,630 feet and the well brought in flowing 240 bbls. of 16.8 gravity oil initially. F. C. Hall No. 20-7-2 has been completed flowing 410 bbls. of relatively clean 16.2 gravity oil daily from 3,100 feet. This new well was finished with 578 feet of 7-inch liner including 530 feet of perforated.

Santa Maria

Union Oil Co. is making good time on No. 1 Russell, located about 1,000 feet south of the discovery well, No. 1 O'Donnell, as the bit is already below 3,850 feet. No. 1 O'Donnell, which is located 2,500 feet south of No. 1 Leroy, which Union carried down to 3,436 feet and abandoned more than a year ago, yielded a crude oil which tested about 2 degrees higher than the oil found in Santa Maria Valley. Pacific Western Oil Co., which recently acquired a lease on the Hobbs property, has finished the derrick for the first well, an east line offset to Union Oil Co. No. 1 O'Donnell in section 21-10-34. Several new rigs are expected to be erected in the Santa Maria area within a few weeks as the Santa Barbara County supervisors recently adopted an ordinance which contains a $100 drilling fee and requires the posting of a $500 bond as assurance that materials and debris will be promptly removed after wells have been abandoned or cease to produce.

Wildcat Exploration

The joint test of Superior Oil Co. and Union Oil Co. northeast of the Ten Section field of Kern County is the deepest wildcat under way in California, as it has reached a depth of 12,482 feet without logging anything of outstanding importance. In the Kettleman North Dome field, Kenda's No. 4-18-J, an outpost, has just passed the 10,390-foot level and appears to be running very low. In the McGunden area of Kern County, Superior Oil Co. abandoned No. 1 Chrome in section 36-29-28 at 5,234 feet, but showings logged a little above 3,000 feet has prompted the company to drill a second test and rig construction is already well under way. Sunset Oil Co. cored about 10 feet of oil sand in its No. 1 west of the Mountain View field in section 17-30-28, but is at present rotating ahead in a gray sand at 5,914 feet.

In the Wasco district of Kern County, Seaboard Oil Corp. is reaming out No. 1-C Kern County Land in section 26-27-24 preparatory to landing a string of casing. This wildcat is bottomed at 9,159 feet and core between 9,140 feet and 9,150 feet revealed a hard brown shale with streaks of oil sand. It has been getting some excellent oil showings on the ditch and appears to be correlating somewhat higher than Continental Oil Co.'s No. 1-A Kern County Land 3 miles northwest, which picked up oil sand at 9,540 feet. These two wildcats may result in the discovery of fields, the seismograph having indicated two highs. Continental Oil Co. is starting a second test north of No. 1-A Kern County Land. In the Rosedale district of Kern County, Continental is rotating ahead in No. 1-B Kern County Land at 8,430 feet. In Los Angeles Basin, Hogan Petroleum Co. abandoned No. 1 McNally, a wildcat in the West Coyote area, as a dry hole at 6,231 feet. In the Newport area of Los Angeles Basin, Mesa Oil Co. has reached a depth of 7,587 feet in its deep test in section 29-6-10, but executives have indicated that an early abandonment will be made unless the formation changes for the better soon.

Oil and gas showings logged a week or so ago by El Rio Oil Co. in a wildcat 3 miles east of Oxnard in Ventura County has resulted in an aggressive leasing campaign by both large and small operators and it is estimated that at least 15,000 acres have been tied up in all directions from the well. Barnsdall Oil Co. has abandoned No. 1 Kern County Land, a wildcat in San Luis Obispo County, in section 1-32-20, at 5,217 feet. Shell Oil Co. No. 21-A Kern County Land, an outpost in the Ten Section field of Kern County, has taken on a dubious outlook at 8,150 feet, as no oil showings have been logged to date. This outpost is over 300 feet lower structurally than the discovery well in the Ten Section field. Western Gulf Oil Co. has abandoned as dry its No. 3 S.P. in the Cantua district of Fresno County after plugging back the hole from 8,525 feet to 6,580 feet and testing.

Lost Hills-Belridge

Belridge Oil Co., discoverer of Miocene and Eocene production in the North Belridge field of Kern County, completed an excellent well in No. 21 in section 1-28-20, brought in flowing 4,584 bbls. of exceptionally clean 32.3-gravity oil and 10,264,000 feet of gas per day from the Wagonwheel zone at 8,473 feet. It was finished with a 9-inch water string landed at 7,975 feet and 512 feet of 4¾-inch liner including 471 feet of 250-mesh. In section 35-27-20, the company picked up the top of the Wagonwheel zone at 8,138 feet and has already taken a penetration of over 100 feet. In section 26-27-20, the company is rigging up No. 61.

El Segundo

Three new wells are scheduled to be given production tests in the El Segundo field of Los Angeles Basin within another week but judging by the character and amount of possibly productive formation none of this trio should show large production. In No. 2 Security the Texas Co. found only about 30 feet of good oil sand while No. 1 Santa Fe of Richfield Oil Corp. has only about 20 feet of oil sand. Ohio Oil Co. No. 3 Gough, which blew out several weeks ago from below 7,000 feet, has been abandoned.

Midway-Sunset

The Texas Co. in the Midway-Sunset field of Kern County completed two wells. Nos. 20 and 21 Midway in section 32-32-24, which were brought in pumping 225 bbls. of relatively clean 22.4 gravity oil and 136 bbls. of clean 22.3 gravity oil per day, respectively. The former was bottomed at 2,944 feet while the latter at 2,870 feet was finished with 27 feet of 6⅝-inch liner including 23 feet of 80-mesh screen. Standard Oil Co. completed No. 48-33-D in section 33-32-24, pumping 453 bbls. of clean 22.8 gravity oil and 5 bbls. of water per day from 2,880 feet. The hole was finished with 220 feet of 7-inch liner carrying 176 feet of 60-mesh.

Kern County

In the Round Mountain field of Kern County Shell Oil Co. completed No. 1-11 Olcese pumping 950 bbls. of clean 17.1 gravity oil per day from 1,950 feet after the hole had been finished with 77 feet of 6⅝-inch liner including 54 feet of perforated. In the Mount Poso field Shell completed No. 12 Vedder Rail in section 9-27-29 pumping 259 bbls. of clean 16.7 gravity oil per day from 1,784 feet. The hole was finished with 45 feet of 6⅝-inch liner carrying 22 feet of perforated. Out in the west front of the Kern River field Barnhart and Morrow's No. 3 Vega in section 11-28-27 has been completed pumping 35 bbls. of 14.6 gravity oil per day from 1,962 feet and Italo Petroleum Co. No. 36 Cauley in section 16-28-27 was brought in pumping 115 bbls. of 15.1 gravity oil cutting 14 per cent per day from 2,913 feet.

Coastal Area

In the coastal area comprising Ventura, Santa Barbara and San Luis Obispo counties Shell Oil Co. completed No. 1-21 Covarrubias in the Capitan field pumping 75 bbls. of clean 33.4 gravity oil from the Sespe formation at 2,655 feet. In the Elwood field of Santa Barbara County Barnsdall Oil Co. recompleted No. 19 Luton Bell, flowing 125 bbls. of relatively clean 42.9 gravity oil per day after redrilling and deepening the hole to 4,555 feet and finishing the hole with 81 feet of perforated 4½-inch liner. In the Ventura Avenue field, located in coastal area, Tide Water Associated Oil Co. completed No. 66 Lloyd doing 298 bbls. of 27.3 gravity oil per day from 5,110 feet on a compressor. The hole was finished with 188 feet of 5-inch liner including 161 feet of perforated. In the Lompoc district of the Santa Maria field, York Oil Co. completed No. 3-A in section 33-8-34 pumping 20 bbls. of 16.3 gravity oil per day from 1,250 feet.

Los Angeles Basin

In the Inglewood field of Los Angeles Basin, Standard Oil Co. completed an excellent producer when No. 83 Los Angeles Investment was brought in flowing 592 bbls. of 28.1 gravity oil, 96 bbls. of water and 138,000 feet of gas per day. This new well was bottomed at 3,655 feet and finished with 208 feet of 4½-inch liner including 136 feet of perforated. In the Dominguez field Union Oil Co. completed No. 46 Hellman flowing 340 bbls. of relatively clean 32.7 gravity oil per day from 5,290 feet.

In the Huntington Beach field Holly Oil Co. has completed No. 7-A pumping 76 bbls. of 25.3 gravity oil per day from 4,060 feet and in the Long Beach field the Coast View Oil Co. recompleted No. 4 Calmont pumping 70 bbls. of 24.5 gravity oil per day from 4,600 feet.

In the Fruitvale field Western Gulf Oil Co. has completed No. 3 Sawyer-Reid flowing 820 bbls. of relatively clean 21.8 gravity oil per day from 3,442 feet.

STANDARD OIL CO. OF CALIFORNIA AND UNION OIL CO.
Crude oil prices at the well effective June 22, 1936

Gravity—	Signal Hill (Long Beach)	Seal Beach	Alamitos Heights	Huntington Beach	Inglewood	Playa del Rey	Olinda-Brea Canyon	Athens-Rosecrans	Dominguez	Elwood Terrace	Torrance	Richfield	Whittier (E. Coyote) (La Habra)	Montebello	W. Coyote Hills	Santa Fe Springs	Mountain View	Elk Hills Buena Vista Hills Midway-Sunset Lakeview Area	Lost Hills	Coalinga	Wheeler Ridge	Kettleman Hills	Santa Paula*	Orcutt*
14-14.9	$ .80	$ .79	$ .74	$ .78	$ .79	$ .80	$ .76	....	....	....	$ .80	$ .76	$ .76	$ .77	$ .78	....	....	$ .70	$ .70	$ .70	....	....	$ .70	
15-15.9	.80	.79	.74	.78	.79	.80	.76	....	....	....	.80	.76	.76	.77	.78	....	....	.70	.70	.70	....	....	.70	
16-16.9	.80	.79	.74	.78	.79	.80	.76	....	....	....	.80	.76	.76	.77	.78	....	....	.70	.70	.70	....	....	.70	$ .70
17-17.9	.80	.79	.74	.78	.81	.80	.76	....	....	....	.80	.76	.76	.77	.78	....	....	.70	.70	.70	....	....	.71	.70
18-18.9	.80	.79	.74	.78	.84	.80	.78	....	....	....	.82	.76	.78	.77	.78	....	....	.70	.70	.70	....	....	.73	.72
19-19.9	.82	.79	.74	.82	.87	.84	.81	....	....	....	.85	.76	.78	.77	.78	....	$ .70	.74	.74	.71	$ .70	....	.75	.74
20-20.9	.85	.79	.74	.85	.90	.88	.84	....	....	....	.88	.78	.82	.77	.80	....	.70	.78	.78	.72	.70	....	.77	.77
21-21.9	.88	.79	.74	.89	.93	.93	.88	....	....	....	.91	.80	.85	.77	.84	$ .78	.73	.82	.82	.74	.70	....	.79	.80
22-22.9	.92	.82	.74	.92	.96	.98	.92	....	....	....	.93	.84	.89	.79	.88	.78	.77	.87	.86	.78	.72	....	.82	.83
23-23.9	.95	.86	.77	.96	.99	1.02	.96	$ .84	$ .79	....	.96	.88	.93	.82	.92	.78	.80	.92	.90	.82	.76	....	.85	.86
24-24.9	.99	.91	.80	1.00	1.02	1.06	.99	.88	.81	....	.99	.91	.96	.85	.96	.82	.84	.97	.94	.86	.79	....	.87	.85
25-25.9	1.03	.95	.82	1.03	1.05	1.11	1.03	.93	.83	....	1.02	.95	....	.89	.99	.86	.88	1.01	.98	.90	.83	....	.90	.91
26-26.9	1.06	1.00	.85	1.07	1.09	1.16	1.06	.98	.86	....	1.05	.98	....	.92	1.03	.90	.91	1.06	1.02	....	....	....	.92	.93
27-27.9	1.10	1.05	.88	1.11	1.12	....	1.10	1.03	.88	....	....	1.02	....	.96	1.06	.95	.95	1.10	1.06	....	....	....	.95	....
28-28.9	1.14	1.10	.90	1.14	1.15	....	1.14	1.07	.90	....	....	1.06	....	.99	1.10	.99	.99	1.15	1.10	....	....	....	.97	....
29-29.9	1.17	1.15	.93	1.18	1.18	F.O.B.	1.17	1.12	.93	....	....	1.09	....	1.03	1.14	1.03	1.02	1.20	1.14	....	....	....	.99	....
30-30.9	1.21	1.19	.95	1.22	1.21	our	1.21	1.17	95	F.O.B.	....	....	....	1.07	1.17	1.08	1.06	1.25	1.18	....	....	....	1.01	....
31-31.9	....	....	....	....	1.24	Pipe	1.24	1.22	.97	Ship	....	....	....	1.11	1.21	1.12	1.09	1.29	....	....	....	....	....	....
32-32.9	....	....	....	....	1.27	Line	1.27	1.27	1.00	....	....	....	....	1.14	1.25	1.16	1.13	1.34	....	....	....	....	....	....
33-33.9	....	....	....	....	....	....	....	1.32	....	$1.28	....	....	....	1.18	1.28	1.20	1.17	1.38	....	....	....	$1.19	....	....
34-34.9	....	....	....	....	....	....	....	1.37	....	1.32	....	....	....	1.22	1.32	1.25	1.20	....	....	....	....	1.23	....	....
35-35.9	....	....	....	....	....	....	....	1.42	....	1.35	....	....	....	1.25	....	1.29	....	....	....	....	....	1.27	....	....
36-36.9	....	....	....	....	....	....	....	1.46	....	1.39	....	....	....	1.29	....	1.33	....	....	....	....	....	1.31	....	....
37-37.9	....	....	....	....	....	....	....	1.51	....	1.43	....	....	....	1.32	....	1.37	....	....	....	....	....	1.35	....	....
38-38.9	....	....	....	....	....	....	....	1.56	....	....	....	....	....	1.36	....	1.42	....	....	....	....	....	1.39	....	....
39-39.9	....	....	....	....	....	....	....	1.61	....	....	....	....	....	1.40	....	....	....	....	....	....	....	1.43	....	....
40-40.9	....	....	....	....	....	....	....	1.66	....	....	....	....	....	1.43	....	....	....	....	....	....	....	....	....	....

Newhall, McKittrick, Kern River, Kern Front and Round Mountain, 70 cents for all grades. *Posted by Union Oil Co. Same company's Brea Canyon schedule stops at $1.14 for 28 degrees and over, and Belridge and Lost Hills schedule stops at $1.32 for 37 degrees and over.

Kansas Developments

By
DAL DALRYMPLE

DAILY OIL FLOW IN KANSAS ABOVE 200,000 BARREL MARK

Daily average production of oil in Kansas the past week was 202,675 bbls., highest in the history of the state. The daily average the previous week was 197,550 bbls. Central and western Kansas counties were credited with approximately 158,000 bbls. of the total daily yield, the balance coming from the southeastern areas. Kansas production has been hovering near the 200,000-bbl. mark for several weeks.

Daily allowable production for June has been set at 190,700 bbls. by the Corporation Commission. This is the quota recommended by the Bureau of Mines, and is an increase of 3,600 bbls. daily over May.

Total potential production for the 17,321 wells in Kansas at the end of May was 2,340,731 bbls., according to T. A. Morgan, director of conservation for the Corporation Commission. This was an increase of 270,025 bbls. during May. On June 1, 1936, total potential for the state was 1,034,717 bbls., less than one-half the current total, 12 months later.

The firm of Roth & Faurot, well known Kansas operators, has been dissolved, C. E. Roth purchasing the interests of W. D. Faurot. Hereafter Mr. Roth will operate as the Roth Oil & Gas Co., and Mr. Faurot, whose home is at Independence, will operate independently. Roth & Faurot have been active in Kansas for about 26 years.

Estimated Daily Production

Estimated daily average production of Kansas for the week ending May 29, and for the preceding week, was as follows:

	Barrels	
	May 29	May 22
Oxford City	1,625	1,400
Burrton	15,275	14,100
Ritz-Canton	5,200	5,100
Graber	3,075	2,825
Hollow-Nikkel	2,525	2,475
Lerado	2,900	3,050
Voshell	2,750	2,700
Wellington	2,975	2,700
Ellsworth County:		
Lorraine	4,975	4,650
Other pools	1,065	1,770
Rice-Barton counties:		
Bloomer	6,025	5,025
Chase	9,475	8,975
Geneseo	1,625	1,600
Raymond	1,700	2,275
Silica	22,125	21,450
Keesling	2,525	2,225
Hauschild	3,450	5,100
Miscellaneous Rice	10,060	8,380
Miscellaneous Barton	4,950	4,710
Russell County:		
Fairport	2,335	2,495
Gorham-East Gorham	3,150	3,230
Russell	2,395	2,495
Sullivan	8,375	8,455
Trapp	7,965	7,655
Miscellaneous Russell	7,305	6,690
Sedgwick County:		
Valley Center	1,130	1,160
Miscellaneous	3,185	3,315
Ellis County:		
Bemis	3,325	4,150
Miscellaneous Ellis	3,725	3,245
Kingman County	710	970
Stafford County	3,025	3,460
Greenwood County	9,700	9,700
Butler County	16,500	16,050
Other fields	25,550	23,970
Total Kansas	202,675	197,550

Rice County

Barnsdall Oil Co. No. 1 Hathaway, SW NW NE section 33-19-10w, Silica district, Rice County topped Siliceous lime at 3,272 feet, total depth 3,284 feet, and swabbed 114 bbls. of oil in six hours. It was acidized and made potential of 1,008 bbls.; liner was perforated and it made new potential of 2,155 bbls.

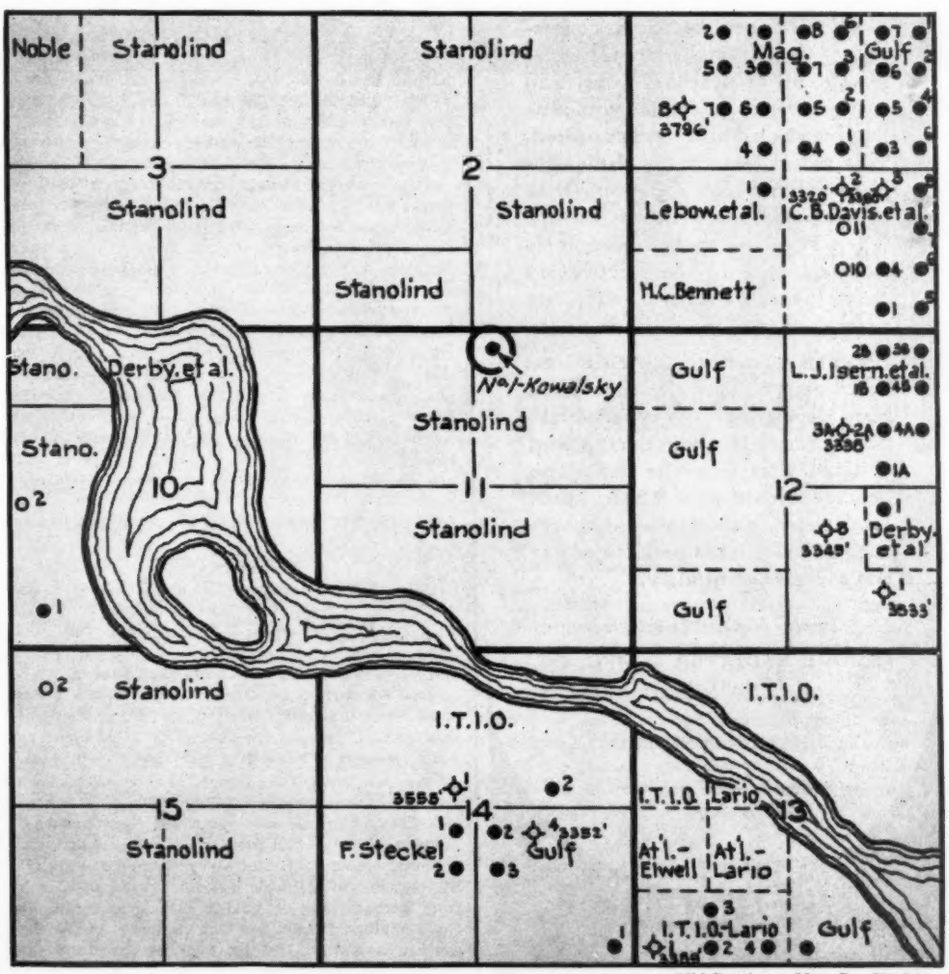
Republic Natural Gas Co. No. 6-A Wendell, NE SE NE section 32-19-10w, made potential of 1,968 bbls. of oil from Siliceous lime at 3,269 feet; total depth 3,286 feet. Gulf Oil Corp. No. 8 Wendell, SE SW SE section 32-19-10w, had Siliceous lime at 3,295-3,307 feet, total depth, swabbed 192 bbls. of oil in six hours, acidized and made potential of 1,750 bbls. Same company's No. 1 Steckel, C W half SE SW section 30-19-10w, was completed as a water disposal well at 3,842 feet, total depth.

Texas Co. No. 1 Schoonover, SE SE NW section 6-19-9w, had Siliceous lime at 3,254 feet and was dry and abandoned at 3,289 feet, total depth. Continental Oil Co. No. 1 Fuller, SE SE NW section 12-18-8w, topped Siliceous lime at 3,244 feet, had 2,600 feet of water in the hole at 3,254 feet, total depth, and was temporarily abandoned.

J. H. Tatlock No. 3 Poncin, NE NW NE section 5-20-10w, made potential of 1,782 bbls. of oil in Siliceous lime at 3,300-07 feet, total depth. Same operators' No. 4 Poncin, SE NW NE section 5-20-10w, had Siliceous lime at 3,308 feet, was bottomed at 3,314 feet, pumped 130 bbls. of oil in three hours, making potential of 1,406 bbls. Gulf Oil Corp. No. 2 Schmidt, NW SE SE section 6-20-10w, was acidized and made potential of 936 bbls. of oil from Siliceous lime at 3,313-22 feet, total depth. Stanolind Oil & Gas Co. No. 16 Specht, SE NW SE section 6-20-10w, had Siliceous lime at 3,304-10 feet, total depth, acidized and made potential of 2,146 bbls.

One failure and three producers were completed in the Hauschild-Theede-Saxman district. L. E. Douglass and Derby Oil Co. No. 4 Hauschild, NW cor. section 15-21-7w, had Conglomerate at 3,369 feet, total depth 3,386 feet, swabbed 373 bbls. of oil in six hours and made potential of 1,492 bbls. Atlantic Refining Co. No. 2 Mills, NE NW NW section 8-21-7w, made potential of 713 bbls. of oil from Conglomerate at 3,335-41 feet, total depth. Same company's No. 2 Patton C, SE SW SW section 5-21-7w, topped Conglomerate at 3,329 feet, total depth 3,334 feet, and made potential of 682 bbls. of oil. D. R. Lauck No. 1 Baker, NE NE SW section 7-21-7w, topped Conglomerate at 3,341 feet, had Chat at 3,368-83 feet, total depth, and was dry and abandoned.

New work in Rice County: Continental Oil Co. No. 1 Powell, SW SE NW section 31-18-7w, building rig; same company's No. 3 Ainsworth, SW SE SE section 24-18-8w, building rig; Empire Oil & Refining Co. No. 1 Prochaska, NW NW SE section 31-18-7w, moving in material; Sinclair Prairie Oil Co. No. 1 Powell, NE NE SW section 31-18-7w, building rig; Atlantic Refining Co. No. 2 Doran, C E half E half SE section 13-19-10w, building rig; Gulf Oil Corp. No. 8 Knop, NE NE NW section 33-19-10w, building rig; Texas Co. No. 8 Kielle, NW SE SW section 34-19-10w, rigging up rotary; Phillips Petroleum Co. No. 1 Fark, SW SE NW section 8-20-10w, rigging up rotary; T. M. Deal Oil & Gas Co. No. 1 Gossman, SW



Mid-Continent Map Co., Wichita.

A large area between the Silica, Ellinwood and Peter pools in Barton County has been proven for development at Stanolind Oil & Gas Co. No. 1 Kowalsky, section 11-20-11w.

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cor. section 4-21-7w, moving in material; Atlantic Refining Co. and others No. 4 Hughes A, NE SE SE section 6-21-7w, location; same company's No. 4 Patton B, NE SE NE section 7-21-7w, building rig; same company's No. 4 Gossman A, NW NE SE section 8-21-7w, cellar; same company's No. 4 Mills, NE SW NE section 8-21-7w, location; Grave Oil Co. No. 4 Gossman, NE cor. section 8-21-7w, rig; H. V. Holland and others No. 1 Brothers, SE cor. section 12-21-7w, wildcat, moving in material; Empire Oil & Refining Co. No. 10 Heckel, SE NE SW section 18-20-9w, building rig; Ohio Oil Co. No. 4 Proffitt, NW SW SE section 18-20-9w, cellar.

Barton County

C. L. Price and others No. 1 Kraft, SW NW NE section 10-17-11w, wildcat pool opener northwest of the Bloomer area in Barton County, made potential of 1,904 bbls. of oil and was completed at 3,288½ feet, total depth. Top of Anhydrite was 665 feet; Kansas City 2,990 feet, Siliceous lime 3,281 feet.

Three other Barton County wildcats were failures. George Dickey and others No. 1 Boger, SE SE NE section 15-16-13w, found Anhydrite at 826 feet, Topeka lime 2,780 feet, Kansas City lime 3,115 feet, Conglomerate 3,365 feet, Siliceous lime 3,368 feet, had a hole full of water at 3,386-89 feet, total depth, and was dry and abandoned. E. F. Wakefield and others No. 1 Scheuermann, NE NE SW section 31-16-15w, topped Anhydrite at 1,070 feet, Topeka 2,925 feet, Kansas City 3,286 feet, Conglomerate 3,515 feet, Siliceous lime 3,550 feet, and was dry and abandoned at 3,580 feet, total depth. Magnolia Petroleum Co. No. 1 Zink, NW NW SE section 13-18-11w, had Siliceous lime at 3,300 feet, total depth 3,326 feet, and was dry and abandoned.

Stanolind Oil & Gas Co. No. 1 Kowalsky, NW NW NE section 11-20-11w, southwest extensioner of the Silica field, was acidized and made potential of 2,260 bbls. of oil from Siliceous lime topped at 3,277 feet, total depth 3,282 feet. It is almost midway between the Silica and Ellinwood pools on the east and west and the Peter pool to the south, opening up a large area to development.

Magnolia Petroleum Co. No. 6 Roetzel, NW NW SE section 24-20-11w, had Siliceous lime at 3,242 feet, was bottomed at 3,251 feet and made potential of 1,470 bbls.

Other Barton County completions included Republic Natural Gas Co. No. 6 McLean, NW NE SE section 25-17-11w, Bloomer field. It had Siliceous lime at 3,287 feet, total depth 3,292 feet, made potential of 121 bbls. of oil, was acidized and made potential of 1,564 bbls. Transwestern Oil Co. No. 2 Meyer, NE SE NE section 13-17-11w, topped Kansas City lime at 3,000 feet, was bottomed at 3,247 feet, acidized, pumped 160 bbls. of oil in six hours, and made potential of 299 bbls. of oil, cutting 4 per cent water. Sinclair Prairie Oil Co. No. 1 Davidson A, NW NE NW section 9-16-11w, was dry and abandoned in Siliceous lime at 3,343-58 feet, total depth.

First reports of new activity in Barton County: Stanolind Oil & Gas Co. No. 1 Dick, SE SE SW section 2-20-11w, location; same company's No. 1 W. M. Panning, SW SW SE section 2-20-11w, location; same company's No. 1 F. Panning, NE NE NW section 11-20-11w, location; Hilligoss and others No. 5 Isern B, NE NW NE section 12-20-11w, moving in material; Magnolia Petroleum Co. No. 8 Roetzel, SW NW SE section 24-20-11w, rig; Carter Oil Co. No. 1 Kroutwurst, NE SE NW section 10-17-11w, location; Shell Petroleum Corp. No. 1 Schneider, C SE section 12-16-14w, wildcat, building rig.

Russell County

Eight new producing wells were completed in Russell County. Largest was W. I. Southern, Inc., No. 7 Michaelis, NW cor. section 31-15-13w, Trapp field. It had Siliceous lime at 3,281-83 feet, total depth, was acidized and made potential of 2,728 bbls. of oil.

Gulf Oil Corp. No. 4 Michaelis, SW NW SW section 32-15-13w, had Siliceous lime at 3,339 feet, was bottomed at 3,353 feet, pumped 790 bbls. of oil in 12 hours and made potential of 1,580 bbls.

Transwestern Oil Co. completed three producers in Township 14-15w. The No. 7 Helen Polcyn, SE cor. section 10, had Gorham sand at 3,258-61 feet, total depth, pumped 580 bbls. of oil in 24 hours, was shot and made potential of 691 bbls. The No. 4 William Polcyn, NW SW SW section 11, made potential of 698 bbls. of oil from Gorham sand at 3,237-39 feet, total depth. The No. 5 William Polcyn, SW cor. section 11-14-15w, had Gorham sand at 3,217-19 feet, total depth, and made potential of 785 bbls. of oil.

Texas Co. No. 1 Rusch, NE NE SW section 9-14-14w, topped Kansas City lime at 3,035 feet, Gorham sand 3,291 feet, had a hole full of water at 3,299-3,303 feet, total depth, plugged back to 3,080 feet, acidized and pumped 228 bbls. of oil in 24 hours.

Stearns & Streeter No. 4 Miller, NE SE NW section 31-14-13w, had Kansas City lime at 2,839 feet, total depth 2,936 feet, was acidized and made potential of 1,151 bbls. of oil in 24 hours, down two hours.

Empire Oil & Refining Co. No. 9 Ehrlich, SW SE SE section 28-13-14w, had Siliceous lime at 3,277 feet, was bottomed at 3,286 feet, was acidized and made potential of 893 bbls. of oil, cutting 1 per cent water.

The following new operations in Russell County were reported: Billings and others No. 1 Boxberger, NE NE SE section 21-14-14w, wildcat, rigging up; Phillips Petroleum Co. No. 2 Rex, NW SW SW section 30-14-14w, building rig; Hartman & Blair No. 9 Rouback, NW SW NW section 2-14-15w, cellar; W. I. Southern, Inc., No. 7 Boomhower A, NW SE NE section 30-15-13w, rig; Derby Oil Co. and Reserve Development Co. No. 5 Michaelis, SW SW NE section 31-15-13w, moving in material; Gulf Oil Corp. No. 5 Hoffman, NE NW SW section 31-15-13w, building rig; Empire Oil & Refining Co. No. 3 Bender A, NE NE NW section 25-15-14w, rigging up rotary; same company's No. 1 Boomhower, SW NW NE section 25-15-14w, building rig; same company's No. 2 Boomhower, SE SE NE section 25-15-14w, location; Gulf Oil Corp. No. 1 Mollie, SE cor. section 25-15-14w, location; Coralena Oil Co. No. 3 Deines, NE SE NE section 36-15-14w, rig; Sinclair Prairie Oil Co. and others No. 4 Sellens, SE NW NW section 36-15-13w, cellar.

Ellis County

Margay Oil Co. No. 3 Bemis C, NW SE SW section 22-11-17w, Bemis field, Ellis County, topped Siliceous lime at 3,467 feet, total depth 3,473 feet, and made potential of 2,706 bbls. of oil. Deep Rock Oil Corp. No. 3 Baumer, SW NW NW section 27-11-17w, made potential of 2,943 bbls. of oil from Siliceous lime at 3,412 feet, total depth 3,419 feet.

Gulf Oil Corp. No. 1 Cress, SE cor. section 12-11-17w, topped Siliceous lime at 3,285 feet, total depth 3,295 feet, pumped 1,084 bbls. of oil in 12 hours and made potential of 2,168 bbls.

Elwell & Tree Oil Co. No. 1 Wickham, SW SW NE section 10-11-19w, wildcat, topped Anhydrite at 1,408 feet, Topeka 3,070 feet, Kansas City 3,350 feet, Simpson 3,624 feet, Siliceous 3,645 feet, and was dry and abandoned at 3,654 feet, total depth.

Lario Oil & Gas Co. No. 2 Walter B, SE SE SW section 2-12-18w, made potential of 1,965 bbls. of oil from Siliceous lime at 3,596 feet, total depth 3,605 feet.

Carter Oil Co. No. 2 Staab, C E half E half NW section 11-12-18w, had Siliceous lime at 3,625-29 feet, total depth, and made potential of 1,693 bbls. of oil. Phillips Petroleum Co. No. 1 Staab, NW NW NE section 11-12-18w, had Siliceous lime at 3,624-30 feet, total depth, swabbed 270 bbls. of oil in eight hours, was acidized and made potential of 2,200 bbls.

J. C. Shaffer, Inc., No. 1 Staab, SE cor. section 25-12-18w, wildcat, found Anhydrite at 1,370 feet, Topeka 3,180 feet, Conglomerate 3,665 feet, Simpson 3,800 feet, Siliceous 3,828-41 feet, total depth, and was dry and abandoned.

Bridgeport Machine Co. No. 2 Madden estate, C NW NW section 26-15-18, found Siliceous lime at 3,553 feet, total depth 3,565 feet, plugged back to 3,563 feet, acidized and made potential of 430 bbls. of oil, with some water.

New work in Ellis County: Deep Rock Oil Corp. No. 7 Baumer, NW NW NE section 27-11-17w, location; Deep Rock No. 8 Baumer, NE NW NE section 27-11-17w, location; Twin Drilling Co. No. 1 Madden estate, SE SE NE section 29-11-17w, moving in material.

Reno County

Wilcox Oil & Gas Co. No. 1 Montford A, NE NW SW section 12-23-4w, Burrton field, Reno County, had Chat at 3,279 feet, total depth 3,415 feet, shot and acidized and made potential of 789 bbls. of oil. Barnsdall Oil Co. No. 6 Westfall A, C S half S half SE section 19-24-4w, was acidized and made potential of 1,021 bbls. of oil from Chat at 3,325-84 feet, total depth. Carter Oil Co. No. 3 Hogan, NE NE SW section 19-24-4w, found Chat at 3,320 feet, was bottomed at 3,395 feet, acidized and made potential of 388 bbls. of oil, with 40 bbls. of water.

National Petroleum Corp. No. 3 Tucker, SW SE NE section 19-24-4w, had Chat at 3,326 feet, total depth 3,391 feet, flowed 120 bbls. of oil in 10 hours, was acidized and made potential of 1,754 bbls. Indian Territory Illuminating Oil Co. No. 2 Mueller, C N half N half NE section 30-24-4w, found Chat at 3,333 feet, total depth 3,376 feet, swabbed 312 bbls. of oil and 35 bbls. of water in 12 hours, was treated with acid and made potential

of 548 bbls. Ohio Oil Co. No. 2 Mueller, NW SW NE section 30-24-4w, pumped 480 bbls. of oil and 60 bbls. of water in 24 hours after acidizing, from Chat topped at 3,350 feet, total depth 3,400 feet.

Sinclair Prairie Oil Co. No. 1 Nett, NW NW SE section 32-26-4w, wildcat, topped Kansas City lime at 2,818 feet, Chat 3,622 feet, Wilcox sand 4,057 feet, had Siliceous lime at 4,156-84 feet, total depth, and was dry and abandoned.

Operations starting in Reno County included: Shell Petroleum Corp. No. 9 Whipple, SW SW NE section 15-26-9w, building rig; National Petroleum Corp. No. 6 Tucker, SW SW NE section 19-24-4w, cellar; Stanolind Oil & Gas Co. and Amerada Petroleum Corp. No. 2 Moore, SE cor. section 8-26-4w, building rig; same companies No. 4 Hilger A, NW cor. section 16-26-4w, building rig.

McPherson County

Continental Oil Co. and others No. 2 Kindblade, SE NW SW section 20-21-1w, Graber pool, McPherson County, was acidized and made potential of 251 bbls. of oil from Hunton lime at 3,282 feet, total depth 3,332 feet.

Magnolia Petroleum Co. No. 1 Klassen, NW NE NW section 21-19-1w, an old well in the Ritz-Canton area, was deepened from 2,955 feet to Wilcox sand at 3,422 feet, total depth 3,431 feet, and made potential 312 bbls.

Stanolind Oil & Gas Co. and others No. 1 Lovett, C NW SW section 13-19-2w, an old well, was deepened from 2,952 feet to 2,961 feet, acidized and made potential of 261 bbls. of oil, with 10 bbls. of water.

Stafford County

Stanolind Oil & Gas Co. No. 8 Heyen B, SE SE NE section 31-22-11w, Richardson pool, Stafford County, had Siliceous lime at 3,543 feet, total depth 3,560 feet, acidized and made potential of 2,017 bbls. of oil.

Lario Oil & Gas Co. and Atlantic Refining Co. No. 4 Morgan, NE NE SE section 23-24-13w, topped Siliceous lime at 4,102 feet and was dry and abandoned at 4,119 feet, total depth.

Stanolind Oil & Gas Co. and Amerada Petroleum Corp. No. 2 Elwell, C S half S half NE section 23-24-13w, had Siliceous lime at 4,070 feet, was bottomed at 4,086 feet, acidized and made potential of 1,082 bbls. of oil, cutting 5 per cent water.

Empire Oil & Refining Co. No. 1 Benton, NE NE SW section 23-24-13w, an old well being deepened, was drilling at 4,103 feet.

Harvey County

E. J. Shaffer and E. B. Shawver No. 1 Hege, NE NE SE section 26-22-2w, Harvey County wildcat between the Halstead and Sperling areas, had Chat at 2,983-3,027 feet, total depth, and was dry and abandoned.

Olson Drilling Co. and Shell Petroleum Corp. No. 5 Nelson, SE SW NW section 30-23-3w, was a cellar.

Lyon County

Young and others No. 1-A Murphy, SE NW NE section 32-21-11e, wildcat in Lyon County, had sand at 1,940 feet and was dry and abandoned at 1,981 feet, total depth.

Butler County

Empire Oil & Refining Co. No. 25 Lathrop, NE SE NW section 17-23-4, Elbing area, Butler County, had pay at 2,072 feet, total depth 2,082 feet, acidized and pumped 400 bbls. of oil and 234 bbls. of water in 43 hours. Its potential rating was 233 bbls. of oil, with 150 bbls. of water.

Louis Kahan and others No. 1-A Madden, SW SW NE section 27-23-4, wildcat, opened a new producing area in Butler County. It topped Lansing lime at 1,800 feet, Kansas City 2,065 feet, total depth 2,212 feet, pumped 20 bbls. of oil and 60 bbls. of water in 24 hours; was acidized and made potential of 30 bbls. of oil, with 60 bbls. of water.

National Refining Co. No. 5 Sutter A, SW SW NE section 1-28-6, had Wilcox sand at 3,174 feet, total depth 3,186 feet, and made potential of 192 bbls. of oil.

Roth & Faurot and others No. 3 King, C W half NE SW section 17-24-4, was a location.

Greenwood County

Gore & Beran and others No. 22 Imthurn, C SW SE section 4-23-13, Greenwood County, had Mississippi lime at 1,758 feet, pay at 1,765-76 feet, total depth, was acidized and pumped 65 bbls. of oil in 24 hours.

Mid-Continent Petroleum Corp. No. 10 Dehlinger A, SW SW NE section 28-23-13, had pay at 1,765-75 feet,

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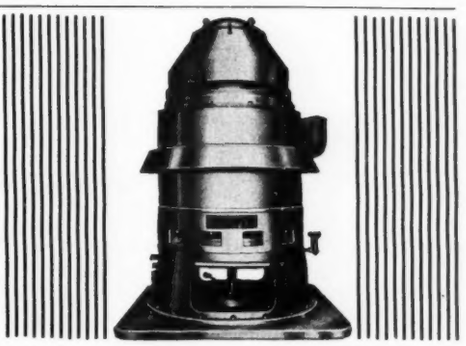

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total depth, was acidized and shot, and pumped 13 bbls. of oil daily.

Western Kansas Oil & Refining Co. No. 1 Taylor, SE SE SW section 6-27-12, Greenwood County wildcat, had spudded.

Elk County

Diller Oil & Gas Co. completed another good Siliceous lime producer in the Key pool, Elk County, at No. 2-A Key, C SW NW section 25-31-10. It had Siliceous lime at 2,264-65½ feet, total depth, and 1,600 feet of oil rose in the hole in 30 minutes. No production test was made and it was completed as a 50-bbl. daily producer, the custom in this district.

Chase County

Propp and others No. 1 Fromm, SE cor. section 29-18-9, Chase County wildcat, had lime at 2,510 feet and was dry and abandoned at 2,803 feet, total depth.

Sumner County

Three producers were completed in the Wellington pool, Sumner County. Continental Oil Co. No. 4 Rothrock, SW NW NW section 4-32-1w, topped Chat at 3,630 feet, total depth 3,675 feet, was acidized and flowed 1,024 bbls. of oil in 24 hours. Amerada Petroleum Corp. No. 1 Nelson, NE NE NW section 5-32-1w, had Chat at 3,358 feet, was bottomed at 3,692 feet, swabbed 21 bbls. of oil and 5 bbls. of water in eight hours, was acidized, reacidized and made potential of 484 bbls. of oil, with 60 bbls. of water. Transwestern Oil Co. No. 1 McKee, NW NW SE section 5-32-1w, found Chat at 3,668 feet and was bottomed at 3,730 feet. It pumped 5 bbls. of oil and 8 bbls. of water daily; later, 380 bbls. of oil and 3 bbls. of water in one day, and finally pumped 2 bbls. of oil and 8 bbls. of water daily.

Amerada Petroleum Corp. and Sunray Oil Co. No. 13-A Gassoway, SE SE SW section 14-32-2e, Oxford area, topped Granite at 3,345 feet, total depth 3,530 feet, and was dry and abandoned.

Steibar Oil Corp. No. 7 Barlow B, SE SW SE section 33-31-1w, was building rig.

Cowley County

E. B. Shawver No. 1 Mulkay, SW NE SE section 5-34-3e, Cowley County, had sand at 3,288-3,321 feet, total depth, and flowed 157 bbls. of oil in 24 hours. Same operators' No. 1 Brewer, NE SW SE section 5-34-3e, found pay at 3,288 feet, had a hole full of water at 3,352-58 feet, total depth, plugged back to 3,323 feet, shot and flowed 8 bbls. of oil daily.

W. M. McKnab No. 1 Moon, Cowley County, was completed as a 250,000-foot gas well in sand at 690-695 feet, total depth.

Bess & Gralapp and others No. 1 Wakefield, NE SE SW section 18-30-6, wildcat, topped Kansas City at 2,204 feet, sand 2,839 feet, Mississippi 2,939 feet, and was dry and abandoned at 3,035 feet, total depth.

Lloyd, Frost & Study and others No. 2 Carson, SW NW SE section 33-31-3e, was moving in material.

Ellsworth County

Spencer & Yarnell completed another large producer in the Ellsworth County extension of the Bloomer field at No. 1 Patzner B, NW NW SW section 31-17-10w. It made potential of 2,441 bbls. of oil from Siliceous lime at 3,245-48 feet, total depth.

Gulf Oil Corp. No. 7 Grizzell, SE NW NW section 31-17-10w, was building rotary rig. Spencer & Yarnell No. 2 Patzner B, NE NW SW section 31-17-10w, was moving in material.

Woodson County

Alexander and others No. 1 Funk, SE SW NE section 22-23-14, Woodson County, had pay at 1,638-46 feet, total depth, was acidized and pumped 119 bbls. of oil in 24 hours. Ward McGinnis No. 1-A Bolles, SW SE NW section 31-23-14, had sand at 1,572 feet, total depth 1,610 feet, plugged back to 1,603 feet, was shot and pumped 10 bbls. of oil and 20 bbls. of water daily.

Pure Oil Co. No. 9 Peek, C E half NE NE section 20-23-14, had Mississippi lime at 1,618 feet, total depth 1,641 feet, acidized, pumped 7 bbls. of oil in eight hours and was estimated as a 20-bbl. well.

M. B. Allen No. 1 Flack, NE NE NW section 1-26-14, had sand at 1,313-42 feet, total depth, plugged back to 1,337 feet and produced 2,300,000 feet of gas.

New work in Woodson County: Morris and others No. 1 Koening, SE SE NW section 35-24-15, wildcat, drilling at 400 feet; Saco Oil Co. No. 2 Hassenpflug, NW NW NE section 34-25-14, location; C. L. Sheedy and others No. 2 College, SW NE SE section 28-25-14, rigging up machine.

Stevens-Morton Counties

Missouri Valley Gas Corp. No. 1 Gustafson, C SW section 29-32-38w, Hugoton area, Stevens County, was completed as an 11,100,000-foot gasser at 2,715 feet, total depth. Southwestern Oil & Gas Co. No. 1 Spikes, C SW section 4-34-37w, was bottomed at 2,841 feet, and produced 4,750,000 feet of gas.

Kuhn Brothers No. 1 Walker, C NE section 33-34-39w, Morton County, was bottomed at 2,774 feet and produced 9,320,000 feet of gas after a shot.

Panhandle Eastern Pipe Line Co. No. 1 Stecher, C SW section 26-32-39w, Stevens County, was a location. Kuhn Brothers and others No. 1 Armstrong, C SE section 16-34-39, Morton County, was rigging up standard tools at 2,600 feet.

Other First Reports

In Rush County, Morgan & Flynn and others No. 3 Korll A, C S half S half NW section 23-18-16w, set 15-inch casing at 211 feet. Schoenfeld & Kitch No. 1 Suppes, SW cor. section 14-16-16w, an old well being deepened, was drilling at 3,525 feet.

In Seward County, United Production Co. No. 1 Central Life Insurance, C NE section 7-31-34w, was rigging up rotary.

In Sedgwick County, Prunty Production Co. and others No. 1 Black, SE SE NW section 16-25-1e, was a cellar, and same operator's No. 1 Smith A, NW NW SE section 16-25-1e, was drilling at 1,170 feet.

Shallow Wells of Good Production in West Kentucky; Estill Leads in East

By SPECIAL CORRESPONDENTS

OWENSBORO, Ky., May 31.—Seven new oil wells averaging 29 bbls. per well in initial production from sands of shallow depth were added to Western Kentucky's list of completed operations in the past week. There were also two gas wells of commercial size and six dry holes drilled.

In Hancock County, Easton district, J. C. Ellis No. 14 Link Richards, was a dry hole through Barlow sand, total depth 544 feet; No. 15 and 16 Link Richards were drilling; No. 9 H. D. Fuqua, 25-bbl. completion, Jackson sand; No. 10 H. D. Fuqua, drilling. W. E. Hupp No. 1 Matt Young, 15 bbls., Jackson sand; No. 4 Emma Falls, drilling. Thomas Galey No. 1 Fred Richards heirs, drilling at 80 feet. Moss Oil Co. No. 1 Mrs. Nora Richards, drilling at 200 feet. Egg Oil Co. No. 3 C. W. Smith, drilling at 215 feet. Eureka Drilling Co. No. 1 Walter Richards, spudding. Frank Damron and others No. 1 Elsie Bates, small gas well.

Lewisport district: Taylor Bros. and others No. 2 T. K. Taylor, drilling 150 feet.

Pellville district: O. D. Vickers and others No. 3 Mrs. M. O. Brown was a 10-bbl. completion in Jett sand 516-549 feet, total depth 549 feet. O. D. Vickers and others No. 4 Mrs. M. O. Brown, location; No. 5 I. C. Stephens, 25 bbls. a day from Jett sand at 511-587 feet, total depth 587 feet; No. 6 I. C. Stephens, location; No. 1 W. D. Richardson, moving in. M. C. Donough & Co. No. 7 Ada Frank, drilling at 110 feet. Miller Bros. No. 7 G. M. Roby, drilling at 300 feet.

Ohio County

Fordsville district: H. Vickers and others No. 9 W. C. Richards' heirs, shut down at 100 feet. Clark & Snyder No. 1 W. E. Hedden, dry hole, no sand, total depth 463 feet. Interstate Oil & Gas Co. No. 1 D. A. Beatty, location.

Westerfield district: W. W. Damron No. 1 Allen King, drilling 450 feet.

Friendship Church district: South-Penn Oil Co. No. 8 F. L. Royal, drilling. Fred J. Young and others No. 10 Oscar Whitehouse, drilling top of Barlow sand, 620 feet. Inland Oil & Gas Co. No. 4 A. S. Crawley, abandoned after a fishing job, drilling new hole at 40 feet. Kentucky Natural Gas Co. No. 3 J. M. Reynolds, location. Rudolph & Kirtpatrick No. 8 J. W. Hardin, drilling.

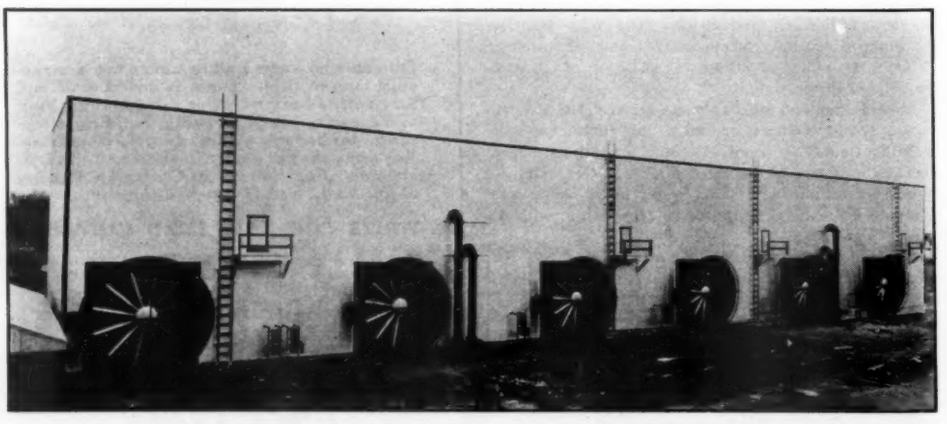
Ralph district: A. Ford and others No. 1 R. P. Ralph, dry hole through Barlow sand.

Heflin district: Carpenter and others No. 1 Oscar James, dry hole, total depth 1,428 feet, drilled 2 feet in Mississippi lime. This well would have made 3 or 4 bbls. in the Bethel sand. Cox & Acton No. 2 Allen Johnson, rigging up.

McLean and Ohio Counties

Hardin pool: Carpenter and others No. 1 William Hardin heirs, 112 acres, drilling 660 feet. W. E. Hupp No. 18, 19, 20 Hackett Bros., drilling. The Petroleum Co. No. 4 Bettie Cullen, 75 bbls. a day from Jett sand; No. 5 Bettie Cullen, drilling 1,108 feet; No. 6 Bettie Cullen, drilling 850 feet; No. 7 Bettie Cullen, moving in. J. C. Miller and others No. 3 Austin & Cullen, Jett sand 1,090-1,097 feet, total depth 1,097 feet, 5,252,000 feet of gas, shut in; No. 4 Austin & Cullen, Jett sand 1,091-1,102 feet, 1,500,000 feet of gas at 1,102-1,127 feet, also flowing oil; No. 5 Austin & Cullen, drilling Jett sand at 1,113 feet; No. 6 Austin & Cullen, moving in. W. E. Hupp and others No. 1 John A. Givens, Jett sand 1,092-1,113 feet, total depth 1,137 feet, waiting for shot. Clark & Snyder No. 2 Barrett heirs, drilling 150 feet. Culbreth and others No. 1 T. E. Howell, in Bethel sand.

(Continued on Page 178)



Forced-draft cooling tower in Pure Oil Co.'s Smiths Bluff, Tex., refinery. The Marley tower has a capacity of 11,400 gallons per hour and cools through a long range to within 5 degrees of the wet bulb. The tower is equipped with 12 fans, six on each side, operated by 20-hp. motors through suitable speed-reducing mechanisms which allow the fans to operate at low speeds.

West and North Texas

By L. E. BREDBERG

DISCOVERY NEAR ROTAN DUE FOR COMPLETION THIS WEEK

FORT WORTH, Tex., May 31.—The northeastern Fisher County discovery, made about 10 days ago by the Southern Oil Corp. on the Joe Robinson lands, in the NW quarter of section 172, Block 2, H.&T.C. Survey, 2½ miles northeast of Rotan, and about 3 miles southwest of the Howard field in which three pumpers are producing from a deeper lime horizon, is still incomplete with the company running a string of casing preparatory to completing. However, it has been flowing into steel tanks since it struck the pay at 3,502 feet and bottomed at 3,505 feet, in Dolomite, and has filled some 4,100 bbls. of storage, while trucks have been hauling oil to the Albany Refining Co.'s plant at Albany, from the well.

Jones Activity

There are now 10 active wildcat tests drilling in Jones County, with another showing as a possible pool opener in the northern part of the county. This test, G. M. Gillespie No. 1 W. H. McKeever, in section 53, O.A.L. Survey, 5 miles southeast of Anson, logged the Cook sand at 2,171-75 feet and started underreaming, preparatory to setting casing and making a test. It has been bailing about 1 bbl. of oil per hour.

Ward County Extension

The southern Ward County area was extended another mile west this week when L. B. Hoss and others No. 1 Blair, located in section 5, Block 32, H.&T.C. Survey, logged oil in the Yates sand, at 2,119 feet and filled 200 feet with oil the first one and one-half hours, filling 300 feet in 20 hours, when shut down at 2,121 feet. This horizon is about 300 feet above the regular Shipley pay, to which the test will be carried before completing unless deeper drilling in the Yates shows it for a better well than it now appears to be.

Seminole Well

The Seminole pool in west central Gaines County received its second well this week as Shell Petroleum Corp. No. 1 S. F. Mann, section 220, Block G, W.T.R.R. Survey, flowed 5 bbls. of oil per hour through 2½-inch tubing run to 5,056 feet, 4 feet off bottom. It is also making 5,450,000 feet of gas daily, which apparently was not shut off when cement was set from 4,912-5,017 feet for this purpose.

Deeper Pay

The northernmost pool in Winkler County, Texas, which will no doubt link up with the Eaves pool across the state line in New Mexico, when tests are drilled on intervening acreage, received another well this week. Gulf Oil Corp. No. 1-A Edwards, section 6, Block 23, P.S.L. Survey, and a west offset to the Finkley and others' discovery for this pool, started flowing 125 bbls. of oil per day from a deeper pay than found in other wells in the pool. Total depth of the hole is 3,148 feet. The well was shot with 90 quarts of nitroglycerin at 3,104-44 feet. The pay in the Finley discovery was logged at 3,120 feet, the hole bottomed at 3,120 feet, but later plugged back to shut off water, which was not entirely successful. This new well is a much better well than the discovery, also.

New Hockley Test

Two miles southeast of the discovery well of the Texas Co., in southwestern Hockley County, Stanolind Oil & Gas Co. has spudded in a test in search of the pay found in the discovery, which was the first oil producer in the county. The new location falls in the center of the southwest quarter of Labour 76, League 37, Zavalla County School Lands, on the Slaughter ranch.

Reeves County Wildcat

The General Crude Oil Co. of Houston (Pew interests) has staked an extreme wildcat location in the northern part of Reeves County, on a block of some 5,500 acres assembled by Bruce McKague and J. N. Gregory of Midland. Location is for a 4,000-foot Delaware sand test in the NE quarter of section 15, Block 56, Township 2, T.&P. Survey, 3 miles northeast of Hagertown, and about 8 miles southwest of the new Mason or Kyle pool in the western part of Loving County, which is producing from the Delaware sand.

Ector Outpost

Location has been staked by the Fuhrman Petroleum Corp. and others in section 41, Block 43, Township 2s, T.&P. Survey, about 3 miles southwest of the Addis pool and 2 miles southeast of the Harper pool in Ector County, on the ranch of E. F. Cowden, and due to its position between the two pools will be an important test.

Andrews Extension

The Fuhrman or Boner pool in southern Andrews County has been extended nearly a mile to the west by the Standard of Texas No. 1 Gray, located in the NE cor. section 21, Block A-42, P.S.L. Survey. It was given a shot, and while cleaning out and testing at total depth of 4,480 feet, made 82 bbls. of oil in 12 hours on gas lift, making a commercial producer and proving more territory for this pool in which there has been slow development.

Western McCulloch

The Salt Gap Development Co. has spudded a wildcat test on the T. C. Ward ranch, three-quarters of a mile east of the Concho-McCulloch County line and about 3¼ miles east of a test drilled by the Maverick Oil Co. on the Jim Rice ranch in section 18, I.N.R. Survey, last year, which for awhile appeared as a producer, but was later abandoned. This new test is in the H. Brandis Survey and will seek the pay found in the Ellenberger lime, Lower Ordovician.

WEST CENTRAL AND NORTH TEXAS

The discovery well of Walter Gant, southeastern corner of Clay County, on the C. M. Worsham lands, in section 38, Block 4, H.&T.C. Survey, which logged the pay at 3,915 feet and drilled 12 feet in before shutting down to set casing and test, made 55 bbls. in a 30-minute test. It is in an area in which three small producers were drilled and later abandoned by the Gulf Oil Corp. because of salt water, and also where several dry holes had been drilled. The Magnolia Pipe Line Co. has a trunk line nearby and is connecting to the well, which is located on a block of some 6,300 acres.

The Benton and Holmes No. 4-A Reed, located in the Beck pool, 4 miles north of St. Joe in Montague County, an old well which has been deepened, logged broken oil sand and lime at 2,320-30 feet last week and is now flowing 7 bbls. per hour, opening a new pay in this pool. Pipe was cemented at 2,317 feet.

Wilbarger Extension

W. W. McDonald No. 3-A Waggoner, NE quarter of section 26, Block 4, H.&T.C. Survey, in the old Greyback pool on the Waggoner Pasture, in Wilbarger County, has opened a deeper pay and extended the deep producing area about 2½ miles southeast. It logged saturated lime at 3,565-85 feet, was acidized with 3,000 gallons with a water load and 550 pounds pressure. While cleaning out it was estimated good for 100 bbls. per day. This new horizon is about 500 feet deeper than the deep pay found in the Phillips discovery in the Rock Crossing pool to the northwest.

Bryson Extension

Barney Cockburn extended the Bryson field in Jack County another mile to the northeast when his No. 1 R. R. Clayton, in the W. Smith Survey, topped the sand at 2,982 feet and drilled to 3,055 feet to set pipe at 2,935 feet. It showed for one of the largest, if not the largest, well in the field estimated good for 100 bbls. per hour.

WEST TEXAS COMPLETIONS

Andrews County

Fuhrman Petroleum Co. No. 5-B Boner, 2,439-4,503 feet, 262 bbls. Humble Oil & Refining Co. No. 22 Means, 4,500-28 feet, 1,100 bbls.

Humble Oil & Refining Co. No. 20 Means, 4,500-32 feet, acidized, 533 bbls.

Crane County

Gulf Oil Corp. No. 8 Henderson, 3,502-42 feet, 648 bbls.

Anderson & Miller No. 1 Durham, dry and abandoned at 2,555 feet; elevation 2,514 feet. Humble Oil & Refining Co. No. 10 Tubbs, 4,300-4,435 feet, acidized, 867 bbls. in six hours.

Ector County

Atlantic Refining Co. No. 2-B Cummins, 4,160-4,255 feet, shot, 220 bbls.; No. 2-D Cummins, 4,140-4,255 feet, shot, 288 bbls.; No. 3-A Rumsey, 4,180-4,260 feet, acidized, 1,158 bbls. Broderick & Calvert No. 5 Foster, 4,035-4,195 feet, shot, 576 bbls. J. P. Cuscak No. 1 University, 3,500-3,740 feet, shot and acidized, 234 bbls. on pump. Devonian Oil Co. No. 3-A Scharbauer, 4,165-4,236 feet, plugged back to 4,222 feet, acidized, 198 bbls. through one-quarter inch choke. Empire Oil & Refining Co. No. 1 Bagley, 4,217-51 feet, shot and acidized, 475 bbls. Landreth Oil Corp. No. 5-C Scharbauer, 4,150-4,229 feet, acidized, 982 bbls. Mabee and Blackstock No. 1 Cummins, 4,150-4,250 feet, acidized, 761 bbls. D. F. Nysewander and others No. 2 Scharbauer, 4,152-4,228 feet, acidized, 1,422 bbls. Shell Petroleum Corp. No. 1-A Cummins, 4,170-4,251 feet, acidized, 605 bbls.

Atlantic Refining Co. No. 1-B Cummins, 4,165-4,250 feet, acidized, 341 bbls.; No. 2-C Cummins, 4,140-4,255 feet, shot, 871 bbls.; No. 1 Johnson, 4,050-4,200 feet, shot, 207 bbls.; No. 3 Cowden, 4,170-4,250 feet, 673 bbls.

Bond & Rumsey No. 3 Rumsey, 4,165-4,250 feet, acidized, 1,173 bbls.; No. 4 Rumsey, 4,155-4,255 feet, 383 bbls.; No. 5 Rumsey, 4,175-4,260 feet, acidized, 882 bbls.

Devonian Oil Co. No. 1-40 Penn-Scharbauer, 4,170-4,215 feet, acidized, 732 bbls.

Landreth Oil Corp. No. 1-H Scharbauer, 4,137-4,210 feet, acidized, 1,348 bbls.; No. 4-C Scharbauer, 4,162-4,232 feet, acidized, 816 bbls. No. 3-F Schabauer, 4,180-4,221 feet, acidized, 1,160 bbls.

Gulf Oil Corp. No. 17 Goldsmith, 4,188-4,208 feet, acidized, 1,710 bbls.; No. 11-B Connell, 3,435-3,700 feet, acidized, 257 bbls.

Glasscock County

Continental Oil Co. No. 32-S Settles, 1,230-80 feet, 426 bbls. on pump.

Continental Oil Co. No. 30-S Settles, 1,208-40 feet, 42 bbls. in 12 hours on pump; No. 31-S Settles, 1,249-1,785 feet, 455 bbls. on pump.

Howard County

Illinois Oil Co. No. 6-B Davis, 2,530-2,856 feet, shot, 689 bbls. on pump. John I. Moore No. 1 Kloh and others, 2,700-2,900 feet, acidized, 213 bbls. on pump. Owen M. Murray No. 2 Logan, 2,650-2,872 feet, shot, 518 bbls. on pump. Standard of Texas No. 7 Dodge, 2,538-2,844 feet, shot, 205 bbls. on pump. Ward Oil Co. No. 26 Roberts, 1,288-1,365 feet, 60 bbls. on pump.

Merrick & Bristow No. 4 Hooks, 3,270 feet, 775 bbls. on pump, 20 per cent water. Merrick & Lamb No. 15

Clay, 3,405 feet, shot, 17 bbls. on pump. American Maracaibo Oil Co. No. 8-A Settles, 2,256-85 feet, 535 bbls. Superior Oil Co. No. 34-B Roberts, 2,964-76 feet. 82 bbls. per hour. Continental Oil Co. No. 3-A Eason, 2,405-50 feet, acidized, 1,325 bbls.

Pecos County

Fred Read No. 1 Byrne, 1,329-71 feet, shot, 10 bbls. on pump. E. M. Thomasson No. 2 Pecos Valley, 1,582-1,619 feet, shot, 202 bbls.

Street and others No. 1 Pecos Valley, 1,437-1,645 feet, 12 bbls. Ohio Oil Co. No. 55-A Yates, 1,438-1,535 feet, 4,200 bbls. in one hour. Pine Rock & Downey No. 1 White & Baker, dry and abandoned at 2,013 feet; elevation 2,846 feet.

Upton County

Arnold Oil Co. No. 3 Harrell, 2,042-2,165 feet, acidized, 266 bbls. British American Oil Co. No. 7 Robbins, 2,265-84 feet, acidized, 894 bbls. Clark and others No. 1 Perry, 2,161-2,216 feet, acidized, 200 bbls. on pump, 50 per cent water. Glenn J. Smith and others No. 1 Burleson, 2,166-85 feet, acidized, 340 bbls. Snowden & McSweeney No. 4 Hughes, 2,277-2,450 feet, plugged back to 2,409 feet, acidized, 91 bbls. and 5 bbls. water.

Humble Oil & Refining Co. No. 20 Ricker, dry and abandoned at 2,207 feet, elevation 2,528 feet. British American Oil Co. No. 5 Robbins, 2,290-2,349 feet, 1,054 bbls. on pump. Cordova Union Oil Co. No. 5 fee, 2,040-61 feet, acidized, 230 bbls.; No. 6 fee, 2,045-51 feet, acidized, 216 bbls.

Weekly Oil Corp. No. 2 Cordova Union, 2,048-63 feet, acidized, 400 bbls.; Brown & Hancock No. 1-B Baker, 2,116-97 feet, 200 bbls. on pump. Texas Pacific Coal & Oil Co. No. 8 Reese, 2,631-37 feet, acidized, 546 bbls. J. W. Ellis No. 4 Robbins, 2,121-30 feet, acidized, 477 bbls.

Ward County

Empire Oil & Refining Co. No. 22 McDonald, 2,215-2,431 feet, shot, 309 bbls. Gulf Oil Corp. No. 23 Estes, 2,487-2,650 feet, shot, 949 bbls.; No. 25 Estes, 2,458-2,650 feet, shot, 2,716 bbls.; No. 26 Estes, 2,517-2,651 feet, shot, 530 bbls. Sinclair Prairie Oil Co. No. 1-B Cornagie, 2,275-2,325 feet, 22 bbls. Turman Oil Co. No. 5 Archenhold, 2,846-3,055 feet, acidized, 22 bbls.

A. Bradford No. 1 Sun-Wathen, 2,205-10 feet, 136 bbls. Texas Pacific Coal & Oil Co. No. 18 James, 2,285-2,480 feet, shot, 615 bbls. Reno Oil Co. No. 5 Hardage-Wilson, 2,350-2,450 feet, shot, 1,014 bbls. Standard Oil Co. of Texas No. 5 Walling-Costley, 2,343-2,525 feet, shot, 116 bbls.; No. 8-37 McFarlane, 2,495-2,650 feet, shot, 2,990 bbls.; No. 11-37 McFarlane, 2,500-2,650 feet, shot, 1,360 bbls.

Amerada Petroleum Corp. No. 2 McDonald, 2,232-2,452 feet, shot, 685 bbls. Gulf Oil Corp. No. 20 Estes, 2,460-2,650 feet, shot, 640 bbls.; No. 21 Estes, 2,500-2,650 feet, shot, 1,127 bbls.; No. 22 Estes, 2,489-2,600 feet, shot, 243 bbls.

Tide Water Associated No. 22 Johnson, 2,559-2,679 feet, shot, 5,400 bbls. Richardson Oils, Inc., No. 2-B University, 2,567-2,737 feet, shot, 1,047 bbls. Humble Oil & Refining Co. 15-F University, 2,550-2,757 feet, shot, 385 bbls.

Winkler County

Harry Adams and others No. 2-A Walton, 3,027-88 feet, shot, 2,754 bbls. Atlantic Refining Co. No. 9 Lovett, 2,820-3,132 feet, shot, 1,010 bbls. Bert Fields and others No. 6 Pure-Clapp, 2,760-3,104 feet, shot, 1,958 bbls.; No. 9 Pure-Clapp, 2,728-3,116 feet, shot, 1,947 bbls. General Crude Oil Co. No. 2 Hess, 3,074 feet, 631 bbls. Gulf Oil Corp. No. 38 Daugherty, 2,830-3,020 feet, shot, 508 bbls.; No. 36 Daugherty, 2,845-3,020 feet, shot, 927 bbls. Humble Oil & Refining Co. No. 17-A Colby, 2,804-3,112 feet, shot, 1,417 bbls.; No. 12-C Colby, 2,804-3,086 feet, shot, 1,076 bbls.; No. 13-C Walton, 3,050 feet, 617 bbls. Magnolia Petroleum Co. No. 10 Colby, 2,923-3,141 feet, shot, 336 bbls. through seven-eighths inch choke. Texas Pacific Coal & Oil Co. No. 20 Daugherty, 2,835-2,945 feet, shot, 499 bbls.; No. 3 Clapp, 2,805-3,104 feet, shot, 897 bbls. Tide Water Associated No. 16 Walton, 2,875-3,130 feet, shot, 996 bbls. W. K. Royalty Co. No. 4-A Walton, 3,045-60 feet, 4,314 bbls.

Humble Oil & Refining Co. No. 3-B Colby, 2,759-3,030 feet, shot, 569 bbls.; No. 11-C Colby, 2,808-3,058 feet, shot, 857 bbls.; No. 7 McCutcheon, 2,804-3,015 feet, shot, 752 bbls. Eastland Oil Co. No. 4 Clapp, 2,750-3,102 feet, shot, 1,357 bbls.; No. 6 Pure-Clapp, 2,734-3,180 feet, shot, 991 bbls. Navarro Oil Co. No. 2 Vaden, 2,720-3,050 feet, shot, 514 bbls. Atlantic Refining Co. No. 8 Lovett, 2,820-3,150 feet, shot, 882 bbls. Monday Oil Co. No. 16 Central State Bank of Abilene, 2,763-3,132 feet, 1,035 bbls.

Gulf Oil Corp. No. 8 Clapp, 2,810-3,113 feet, shot, 436 bbls.; No. 35 Daugherty, 2,800-3,020 feet, shot, 1,251 bbls. Maxwell No. 2-B Gartex, 2,828-3,138 feet, shot, 682 bbls. Shell Petroleum Corp. No. 4-M Hendricks, 2,805-3,095 feet, shot, 467 bbls.; No. 4-K Hendricks, 2,799-3,095 feet, shot, 308 bbls. Skelly Oil Co. No. 6 Colby, 2,850-3,100 feet, shot, 980 bbls. Bert Fields, No. 8 Clapp, 2,750-3,115 feet, shot, 1,648 bbls. Sun Oil Co. No. 4 Daugherty, 2,819-2,936 feet, shot, 414 bbls. Empire Oil & Refining Co. No. 2-E Daugherty, 3,007-80 feet, 846 bbls. K. D. Oil Co. No. 1 Pink Mitchell, temporarily abandoned, 3,666 feet. York & Harper and others No. 1 Gunter and Munson, dry and abandoned 5,004 feet. Richardson No. 1-B Walton, 3,278-3,444 feet, shot, 146 bbls.

Yoakum County

Texas Pacific Coal & Oil Co. No. 1 Bennett, 5,305 feet. Plugged back to 5,275 feet, 572 bbls. of oil and 1,000,000 feet of gas.

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WEST CENTRAL TEXAS COMPLETIONS

Callahan County

Charles Hobbs and others No. 1 Hughes, 810 feet, dry and abandoned.

Beams Drilling & Production Co. No. 16-D Jackson, 1,360 feet, dry and abandoned.

Eastland County

C. R. Cox and others No. 1 Ed O'Rear Estate, 2,801-18 feet, 5 bbls.

Hoffman & Page No. 1 Dodd, 3,108-28 feet, total depth 3,440 feet, 4,884,000 feet gas. States Oil Corp. No. 8 Parrock, 1,856-40 feet, 10 bbls.

Jones County

R. B. Farris and others No. 8 Guitar, 1,988-2,008 feet, 40 bbls., treated 2,000 gallons acid, 250 bbls. per day; No. 9 Guitar, 1,975-2,007 feet, 653 bbls. Guitar Trust Co. No. 1 fee, 1,970-2,005 feet, treated with 3,000 gallons acid, 900 bbls. in 15 hours. T. D. Humphrey No. 20 Dorsey, 2,214-19 feet, 119 bbls. per day on pump; No. 2 Guitar, 1,981-2,005 feet, treated with 2,000 gallons acid, 610 bbls. A. P. Kouri and others No. 1 Winkles, total depth 2,104 feet, dry and abandoned. Sandy Ridge Oil Co. No. 2 McCreight, 1,921-38 feet, shot 20 quarts, 30 bbls.

Fain & McGaha Oil Corp. No. 1-B Hayden, 2,505 feet, dry and abandoned. R. B. Farris No. 1 Guitar, 1,983-2,014 feet, treated 3,000 gallons acid, initial production 624 bbls. Petroleum Producers Co. No. 2 H. C. Harvey, 1,667 feet, dry and abandoned. Ungren & Frazier No. 9 Dorsey, 2,204-14 feet, treated 2,000 gallons acid, initial production 820 bbls. in 11 hours; No. 3 Dorsey "A," 2,148-55 feet, 129 bbls.; No. 5 Dorsey "D," 2,215-23 feet, treated 2,000 gallons acid, initial production 735 bbls. in 20 hours.

Palo Pinto County

Palo Pinto Oil & Gas Co. No. 19 Strawn Coal Co., 3,029-53 feet, 2,500,000 feet of gas.

A. S. Hickok No. 4 Robinson, 1,505-26 feet, total depth 1,530 feet, 30 bbls.

Shackelford County

Albany Oil Co. and Pardue No. 11 Davis, 1,607-22½ feet, 100 bbls. Bell Oil & Gas Co. No. 2 Davis, 1,841 feet, dry and abandoned. Hammond & Fortex Oil Co. No. 1 T. W. Lee, 1,031-41 feet, 35 bbls. W. J. Healy No. 9 Clark, 673 feet, 10 bbls. Tannehill Oil Co. No. 41 Newell, 920-38 feet, 75 bbls. Westexas Oil & Royalty Co. No. 11 Morris, 1,587-97 feet, 50 bbls.

Baker Oils, Inc., No. 1 Davis-Walker, 1,567-71 feet, shot 30 quarts, 30 bbls.

Taylor County

Fields, Finley & Cherry No. 1 Hinds, total depth 2,355 feet, dry and abandoned. S. B. Roberts Co. and Brown Eagle Oil Co. No. 1 John Harris, 2,110 feet, dry and abandoned.

Wise County

Texas Canadian Development Co. No. 1 W. D. Nimno, 3,503 feet, dry and abandoned.

PANHANDLE COMPLETIONS

Carson County

Empire Oil & Refining Co. No. 10-D Magnolia, 2,964-3,012 feet, 550 bbls. on pump. Skelly Oil Co. No. 84 Schafer, 2,995-3,085 feet, 985 bbls.

Gray County

Doniphan Oil & Gas Co. No. 3 Cobb, 3,291-3,372 feet, plugged back to 3,335 feet, shot, 357 bbls. and 70 bbls. water.

Doniphane Oil Co. No. 3 Cobb, 3,291-3,372 feet, plugged back to 3,335 feet; shot, 362 bbls. oil and 70 bbls. water on pump. King Oil Co. and others No. 6 Jackson, 3,165-3,245 feet, shot, 705 bbls. on pump. Magnolia Petroleum Co. No. 1 Catlin, 3,114-3,212 feet, shot, 671 bbls. on pump. Shell Petroleum Corp. No. 4 Haggard, 3,220-3,300 feet, shot, 581 bbls. on pump. Southern Petroleum Exploration Co. No. 6 Baird, 3,190-3,256 feet, shot, 663 bbls. Stanolind Oil & Gas Co. No. 10-C Cobb, 3,303-29 feet, on pump, shot, 165 bbls. on pump. Texwell Oil Co. No. 1 Frashier, 2,873-3,035 feet, 12,-268,000 feet gas.

Hutchinson County

Drilling & Exploration Co. No. 11 Haile, 3,010-74 feet, shot, 327 bbls. on pump. Huber Petroleum Co. No.

TRY THIS ONE

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THE EVERSTICK ANCHOR COMPANY
Fairfield, Iowa

1 Magnolia-Herring, 2,675-3,792 feet, 44,800,000 feet gas. Phillips Petroleum Co. No. 2 Staples, 3,152-3,202 feet, shot, 452 bbls. on pump.

Bonner and others No. 2 Moore, 3,110-68 feet, shot, 452 bbls. on pump. Phillips Petroleum Co. No. 1 Thompson, 3,175-3,261 feet, shot, 548 bbls. on pump. Skelly Oil Co. No. 6 Watkins, 2,855-2,935 feet, shot, 552 bbls. on pump. The Texas Co. No. 6 Moore, 3,105-57 feet, shot, 350 bbls. on pump.

Moore County

Phillips Petroleum Co. No. 1 Pythian, 2,925-3,275 feet, 45,100,000 feet gas. Shamrock Oil & Gas Co. No. 4 J. T. Sneed, Jr., 2,420-3,195 feet, plugged back to 2,692 feet, shot, 10,600,000 feet gas.

Anderson & Kerr No. 1 Bridges, 2,800-3,410 feet, shot, 15,724,000 feet gas. Phillips Petroleum Co. No. 1 Gable, 2,885-3,250 feet, 59,008,000 feet, gas; No. 1 Vaughn, 3,135 feet, 74,744,000 feet gas.

Wheeler County

Elbar Corp. No. 11 Noel, 2,423-70 feet, shot, 59 bbls. on pump.

Alma Oil Co. No. 4 Perkins, 2,207-2,470 feet, 6,529,000 feet gas.

NORTH TEXAS COMPLETIONS

Archer County

Nick Anagnos No. 9 J. S. Bridwell, 865-1,052 feet, 12 bbls. L. T. Burns No. 1 C. B. Abney, 1,770 feet, dry. Luther Hedrick No. 1 W. M. Coleman, 1,500 feet, dry. King Oil Co. No. 10 J. J. Perkins, 990-1,001 feet, 40 bbls. F. L. Pilkenton No. 1 E. N. Birdwell, 622-30 feet, 5 bbls. Guy J. Scholl and others No. 3 Claude Cowan, 1,170 feet, dry. Sinclair Prairie Oil Co. No. 4 J. T. Richardson, 1,350 feet, dry.

Mrs. Thelma Andrews No. 1 N. I. Andrews, 1,054 feet, dry. J. D. Carpenter No. 1 J. D. Carpenter, 1,153 feet, dry; Golding & Cochran No. 2 J. M. Kunkel, 1,153-67 feet, 12 bbls. G. E. Grininger No. 1 R. O. Prideaux, 1,002 feet, dry.

Clay County

The Texas Co. No. 3 Saner, 1,080-1,300 feet, 75 bbls. Bridwell Oil Co. No. 10 Saner, 1,113-19 feet, 20 bbls.; No. 11 Saner, 208-19 feet, 12 bbls. Regal Oil Co. No. 4 W. F. George, 1,179 feet, dry.

Cooke County

Kerlyn Oil Co. No. 3 C. B. Blagg, Jr., 2,038-60 feet, 50 bbls.; No. 1 F. C. Owen, 1,945 feet, dry. Bridwell Oil Co. No. 3 R. W. Trew B, 1,728 feet, dry. F. W. Merrick, Inc., No. 38 Knabe, 785-813 feet, 12 bbls. Mudge Oil Co. No. 20 Alice Johnson, 1,237 feet, dry. Vindicator Oil Co. No. 14 Walterscheid, 789-93 feet, 10 bbls.

Dover Oil Co. No. 8 J. A. Carr, 1,940-50 feet, 55 bbls.; No. 11 J. A. Carr, 1,936-47 feet, 55 bbls.; No. 13 J. A. Carr, 2,045 feet, dry. Kingery Brothers and others No. 1 H. Henscheid A, 756-75 feet, 25 bbls. Ripps & Ungerman No. 7 W. L. Johnson, 1,911-24 feet, 135 bbls.

Denton County

Boliver Drilling Co. No. 1 R. Bentley, 2,118 feet, dry. George A. Greer No. 1 T. M. Ross, 2,302 feet, dry.

Montague County

N. H. Martin & Son No. 4 Mrs. M. H. Salmon, 1,146-86 feet, 15 bbls. Pure Oil Co. No. 6 W. W. Jones A, 925-932 feet, 6 bbls.

Ruble & Lowry No. 1 J. E. Lemon, 978 feet, dry. Sinclair Prairie Oil Co. No. 1 Viola Holt, 1,746-66 feet, 50 bbls. Texas Co. No. 16 R. W. Cunningham A, 928-44 feet, 79 bbls.; No. 3 J. E. Lemon, 904-26 feet, 60 bbls.; No. 4 J. E. Lemon, 903-24 feet, 45 bbls.

Montague Oil Co. No. 1 Ball, 4,238 feet, junked and abandoned. Selby Oil & Gas Co. No. 1 J. W. Batts, 5,539 feet, dry. The Texas Co. No. 17 R. W. Cunningham A, 908-26 feet, 50 bbls.

Jack County

Beard & Collier No. 1 Ezzell B, 2,942-68 feet, 260 bbls. Edwards and others No. 4 Simpson, 2,981-3,000 feet, 275 bbls. Jack Kadane and others No. 1 George Evett, 3,125-3,220 feet, 1,000,000 feet gas. Nelson Oil Syndicate No. 1 W. J. Etherley, 3,435-37 feet, 6 bbls. Peery Woody and others No. 3 J. A. Raley B, 2,930-64 feet, 600 bbls. C. D. Thornton No. 3 F. C. Dailey, 547 feet, dry. Duncan Holt & Marchman No. 21 S. M. J. Benson, 900-15 feet, 150 bbls.

Brazos River Gas Co. No. 5 J. A. Jones, 2,362-82

(Continued on Page 178)

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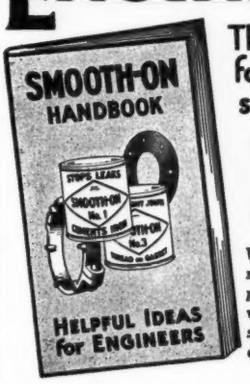

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Canadian Fields

Completions and Operations in Northwest and in Ontario

By VICTOR LAURISTON

CHATHAM, Ontario, May 29.—On the west side of South Turner Valley, Royalite Oil Co. No. 3 Sterling Pacific, LSD 13, section 33-18-2w5, bottoming in the Madison at 6,788 feet, was treated with acid, resulting in a large increase in crude production. The well started last December at about 110 bbls. a day from the lime. Tubing was run, getting a peak production of 135 bbls., which later varied from 100 to 123 bbls. Flush production after the first blowout following acidization run between 500 and 600 bbls., later settling to between 280 and 300 bbls. Location is a mile north of No. 4 Sterling Pacific, the largest producer in the field. Previous acid treatments in Turner Valley secured only small production increases, and the development in this test of a composition especially suited to the Turner Valley limestone will probably result in more extensive acid treatment of small wells.

In section 21-18-2w5, Newfold Royalties No. 1, LSD 11, is cleaning out after a shot of 510 quarts. Wet gas flow increased from 2,000,000 to 3,000,000 feet a day, which later froze off, the shot partly bridging the hole.

West Central Field

In the West Central Turner Valley area, Dalhousie Oil Co. No. 8, LSD 6, section 30-19-2w5, has cleaned out following a shot of more than 1,000 quarts. No. increase in production from the lime was indicated, but casing will be perforated for a test of the Dalhousie sands.

Mercury Royalties No. 1, LSD 8, section 5-19-2w5, is below 2,827 feet after changing to rotary outfit.

Vantage Oils, Ltd., of Vancouver, British Columbia, has located its No. 1 in LSD 9, section 24-19-3w5, about a mile due west of the famous Home section, section 20-19-2w5, one of the most prolific naphtha areas in South Turner Valley. It is southwest of Dalhousie No. 8.

In section 5-19-2w5, North American Petroleums No. 1, LSD 10, is shut down after spudding.

West Side Tests

On the west side of South Turner Valley, Royalite Oil Co. No. 5 Sterling Pacific, LSD 12, section 33-18-2w5, is below 4,424 feet.

West Turner Petroleums No. 1, LSD 2, section 32-18-2w5, is rigging rotary outfit. West Flank Oil Co. No. 1, LSD 1, is below 50 feet. Richland No. 3, LSD 14, section 32-18-2w5, is in the Kootenays below 5,540 feet and expected to get the Madison limestone around 5,750 feet. It is expected to be the next completion.

In section 29-18-2w5, Granville Oils No. 1, LSD 16, has resumed after cementing 9⅝-inch casing at 3,053 feet. Command Oils No. 1, LSD 14, is below 150 feet. National Petroleum Corp. No. 1, S half same LSD, is below 650 feet.

In section 20-18-2w5, Spy Hill Royalties No. 1, LSD 16, has all equipment on the ground. Royal Canadian Oils No. 1, LSD 15, has spudded. Monarch Royalties No. 1, LSD 9, is below 5,326 feet, after getting the Stockmen sands at 5,203 feet and is expected to get the Madison lime around 6,300 feet.

North Turner Valley

In North Turner Valley, Home Oil Co. of Vancouver, British Columbia, has started derrick for a test in LSD 8, section 33-20-3w5. Rotary outfit has been moved to the location.

High River-Aldersyde

In the High River area, east of Turner Valley, Arca Development Corp. No. 1, NW quarter section 24-18-1w5, the first attempt to shut off sulfur water encountered in the lime at 8,988 feet was unsuccessful. A second plug was cemented, and production test of the upper lime and the Dalhousie sand will be made.

On the Aldersyde structure, Ranchmen's Gas & Oil Co. No. 1, LSD 16, section 13-20-29w4, is below 7,125 feet after installing new drilling line.

On the New Valley structure, McLeod Oil Co. No. 1, LSD 4, section 6-21-2w5, is standing cemented at 7,450 feet.

Tests in the Foothills

In the Forest Reserve area west of Olds, Hunter Valley Oil Co. No. 1 McLaren, LSD 12, section 13-31-10w5, is below 7,593 feet.

On the Duncan structure, Spindletop Oils No. 1, LSD 4, section 1-30-6w5, is below 309 feet, after being delayed by a fishing job and a bush fire which threatened the outfit.

On the Moose dome, Devonian Oils (formerly Moose Oils) No. 2, LSD 8, section 29-22-6w5, is running casing to bottom at 750 feet to shut off first gas before deepening in the Devonian limestone.

On the Highwood-Sinclair structure, southwest of Turner Valley, Sound End Petroleums No. 1, LSD 6, section 36-18-3w5, has cleaned out to bottom at 4,525 feet with rock bits and is changing to diamond drill to deepen for a test of the Madison, expected around 5,050 feet. A gas line has been laid to Turner Valley for fuel. Maple Leaf Royalties No. 1 Banner, LSD 6, section 34-17-3w5, is making new hole from 2,775 feet after sidetracking lost tools.

On the Mill Creek structure west of Pincher Creek, Weymarn Petroleums No. 2, LSD 5, section 7-6-1w5, bottoming at 5,960 feet, is cementing to overcome caving which developed during the bailing test. Bailing showed considerable quantities of light green crude of 43.5-gravity and paraffin base, apparently coming from the Dalhousie sand. The crude is free from sulfur. The production test will be continued. The Heiland Co. with a geological party from Denver is conducting a survey for a number of companies holding acreage in the Pincher Creek area.

Border Fields

On the Twin River structure south of Lethbridge, Del Bonita Associated Oils No. 2, LSD 9, section 10-2-20w4, standing cemented in the top of the lime at 3,988 feet, is starting to drill into production.

West of Lethbridge, Lethbridge Petroleums & Refining No. 1, LSD 12, section 11-8-22w4, has spudded. Madison limestone, the chief potential oil horizon, is looked for at 3,800 feet with possibilities for a gas sand around 2,600 feet. Standard tools are being used.

South and east of the Rogers-Imperial gasser, E. Byers Emrick of Conrad has spotted a test for Model Oils, Ltd., of Calgary and associate interests on the Fey ranch in NE SW section 5-37n-3e.

Steveville Operations

In the Steveville district, east of Calgary, Anaconda Oils No. 1, LSD 15, section 9-22-12w4, is rigging for a test.

Wainwright Field

In the Wainwright field, east-central Alberta, Battleview Oils No. 1, LSD 13, section 32-47-5w4, has spudded. Rotary tools are being used. The first oil sand is expected at 2,100 feet.

Drilling Contractors

(Continued from Page 145)

which will be drilled for Smith & McDannald and others. Contract was received from the Tide Water Oil Co. for No. 4 Smedes at the St. Martinsville field while another was received from the Pure Oil Co. for another well on the Shelor lease, following the completion of No. 1-B Sealy Hutchins for a distillate well. In the same field, Pan American Production Co. No. 3 Craig is below 5,000 feet, while in Wharton County the contractors are drilling their No. 1 Fain at the Louise field and are below 5,700 feet on No. 1 Martin a wildcat near the town of El Campo.

A. E. Wallace has resigned as operating chief of the Western Gulf Oil Company, California subsidiary of the Gulf Oil Company. He is succeeded by R. P. Huggins.

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WILDCAT OPERATIONS

CALIFORNIA

IMPORTANT WELLS AND NORTHERN CALIFORNIA WILDCATS

Company, well and location—	S.T.R.	Depth	Status
Shell Oil, No. 1-21 Capitan, Santa Barbara Co.	32- 5-30	2,655	pump. 140 b.d.
Shell Oil, No. 1-22 Capitan, Santa Barbara Co.	32- 5-30	2,772	O.S. drlg.
Barnsdall-Richfield, No. 19-B Elwood, Santa Barbara	15- 4-29	4,555	flow. 150 b.d.
Hancock-Bush, No. 1-B Santa Maria, Santa Barbara	26-10-34	5,167	Schist
Sed Oil, No. 1 Mills, Santa Maria, Santa Barbara	27-10-34	131	sd. sh. dr'g.
Cohn & Mitchell, No. 1-G Santa Maria, Santa Barbara	18-10-34	1,931	sd. sh. drlg.
Union Oil, No. 3-M Santa Maria, Santa Barbara Co.	30-10-33	1,391	sd. sh. drlg.
Union Oil, No. 1-R Santa Maria, Santa Barbara Co.	21-10-34	3,430	sd. sh. drlg.
Union Oil, No. 3-V Santa Maria, Santa Barbara Co.	30-10-33	3,957	sd. sh. drlg.
Union Oil, No. 3-23-E Santa Maria, Santa Barbara Co.	23-10-34	3,638	rig. to pump
Union Oil, No. 18 Orcutt, Santa Barbara Co.	26- 9-34	4,107	bailing
Rice Ranch Oil, No. 4 Orcutt, Santa Barbara Co.	23- 9-34	3,780	br. sh. dr'g.
Valley Oil, No. 1 Casmalia, Santa Barbara Co.	20- 9-34	2,340	rig. to pump
Arnold Oil, No. 2 Los Alamos, Santa Barbara Co.	8- 8-33	2,570	br. sh. drlg.
Moyle, B. A., No. 1 Gato Ridge, Santa Barbara Co.	4- 8-32	3,270	D.P. stuck
Stewart-Carter Oil, No. 1 Gato Ridge, Santa Barbara	4- 8-32	3,616	idle
Petrol Corp., No. 43-A Gato Ridge, Santa Barbara Co.	9- 8-32	3,015	sd. sh. drlg.
York Oil, No. 3-A Lompoc, Santa Barbara Co.	33- 8-34	1,250	pump. 20 b.d.
Nine Springs Oil, No. 1 Los Olivos, Santa Barbara	9- 7-30	3,310	cmtd. 2,745
Oatman Mining, No. 1 Mesa, Santa Barbara Co.	28- 4-37	2,050	sd. sh. drlg.
Petroleum Securities, No. 5 Ranch, Shiells, Ventura	3- 3-19	4,320	sd. sh. drlg.
Texas Co., No. 129 Shiells, Ventura Co.	4- 3-19	4,812	P.B. 3,317
Texas Co., No. 132 Shiells, Ventura Co.	4- 3-19	4,096	sd. sh. drlg.
Union Oil, No. 16 Bardsdale, Ventura Co.	12- 3-20	4,290	sd. sh. drlg.
Condor Oil, No. 1 Sespe, Ventura Co.	6- 4-19	1,820	br. sh. drlg.
Ivers, H. A., No. 14 Star, Sespe, Ventura Co.	1- 4-20	876	sd. sh. drlg.
Topa Topa Oil, No. 2 Sespe, Ventura Co.	33- 5-19	3,460	sd. sh. drlg.
Speik Oil, No. 2 Sespe, Ventura Co.	33- 5-19	2,310	br. sh. drlg.
Colima Oil, No. 2 Sespe, Ventura Co.	25- 5-19	2,451	sd. sh. drlg.
Bolsa Chica Oil, No. 1-H Temescal, Ventura Co.	5- 4-18	3,681	idle
Pacific Western Oil, No. 8 Temescal, Ventura Co.	4- 4-18	2,397	sd. sh. drlg.
Vai, Giovani, No. 1 Ojai, Ventura Co.	4- 4-21	300	hd. sd. drlg.
Texas Co., No. 1 Saticoy, Ventura Co.	31- 3-21	191	sd. sh. drlg.
Continental Oil, No. 1 Red Mountain, Ventura Co.	7- 3-23	7,410	hd. sh. drlg.
Continental Oil, No. 7 San Miguelito, Ventura Co.	23- 3-24	5,625	sd. sh. drlg.
C. C. M. Oil, No. 2 Padre Canyon, Ventura Co.	23- 3-24	6,465	redrlg. 3,860
Continental Oil, No. 3 Padre Canyon, Ventura Co.	15- 3-24	6,252	hd. sh. drlg.
El Rio Oil, No. 1 Oxnard, Ventura Co.	6- 1-21	2,770	sd. sh. drlg.
Tide Water A. O., No. 31 V.L.W., Ventura, Ventura	24- 3-23	1,763	sd. sh. drlg.
Tide Water A. O., No. 29 Lloyd, Ventura, Ventura	27- 3-23	7,320	P.B. 7,230
Tide Water A. O., No. 60 Lloyd, Ventura, Ventura	27- 3-23	5,944	sd. sh. drlg.
Tide Water A. O., No. 64 Lloyd, Ventura, Ventura	27- 3-23	7,080	swabbing
Tide Water A. O., No. 66 Lloyd, Ventura, Ventura	27- 3-23	5,197	flow. 298 b.d.
Tide Water A. O., No. 81 Lloyd, Ventura, Ventura	27- 3-23	7,600	rigged up
Tide Water A. O., No. 137 Lloyd, Ventura, Ventura	27- 3-23	7,265	hd. sh. drlg.
Shell Oil, No. 91 Taylor, Ventura, Ventura Co.	30- 3-23	5,844	sd. sh. drlg.
Shell Oil, No. 35 Gosnell, Ventura, Ventura Co.	28- 3-23	8,770	redrlg. 8,750
General Pet., No. 17 Barnard, Ventura, Ventura	23- 3-23	7,185	hd. sh. drlg.
Den Petroleum, No. 1 Devils Den, Kern Co.	20-25-19	4,274	br. sh. drlg.
Texas Co., No. 11-9 Theta, Lost Hills, Kern Co.	11-26-20	1,821	sd. sh. drlg.
Amerada Pet., No. 4 Blackwell Corner, Kern Co.	17-26-19	788	hd. sh. drlg.
Santa Ynez Oil, No. 1 Temblor, Kern Co.	36-29-20	482	cmtd. 482
Franco Western Oil, No. 13 McKittrick, Kern Co.	8-30-22	2,184	sd. sh. drlg.
East Puente Oil, No. 2-11 McKittrick, Kern Co.	11-30-21	1,104	sd. sh. drlg.
Seaboard Oil, No. 1 Wasco, Kern Co.	26-27-24	9,159	reaming
Belridge Oil, No. 3-35 North Belridge, Kern Co.	35-27-20	6,594	sd. sh. drlg.
Belridge Oil, No. 24-35 North Belridge, Kern Co.	35-27-20	8,225	br. sh. drlg.
Belridge Oil, No. 21-1 North Belridge, Kern Co.	1-28-20	8,473	flow. 4,584 b.d.
Continental Oil, No. 9 North Belridge, Kern Co.	36-27-20	4,673	sd. sh. drlg.
Tide Water Associated, No. 6 North Belridge, Kern	34-27-20	5,131	br. sh. drlg.
Texas Co., No. 1 Martin, North Belridge, Kern Co.	22-27-20	5,048	redrlg. 3,020
Honolulu Oil, No. 20 Round Mountain, Kern Co.	20-28-29	1,976	O.S. drlg.
Link, E. A., No. 1 Conry, Round Mountain, Kern Co.	30-28-29	1,195	sd. sh. drlg.
Eastmont Oil, No. 2 Round Mountain, Kern Co.	16-28-29	1,750	sd. sh. drlg.
Shell Oil, No. 1-11 Olcese, Round Mountain, Kern Co.	17-28-29	1,950	pump. 950 b.d.
Republic Pet., No. 1 Cal Tech, Kern Front, Kern Co.	24-28-27	1,815	O.S. drlg.
Italo Petroleum, No. 36 Kern Front, Kern Co.	16-28-27	2,913	pump. 114 b.d.
Apex Petroleum, No. 10-2 Kern Front, Kern Co.	10-28-27	2,193	rig. to pump
Oil, Inc., No. 7-2 Kern Front, Kern Co.	13-28-27	1,289	P.B. 1,247
General Pet., No. 53 Young, Kern Front, Kern Co.	13-28-27	1,198	sd. sh. drlg.
Barnhart & Morrow, No. 3 K.C.L., Kern Front, Kern	11-28-27	1,962	pump. 40 b.d.
California Star Oil, No. 8-40 Kern Front, Kern Co.	22-28-27	2,365	sd. sh. drlg.
H. C. L. Co., No. 1 Kern Front, Kern Co.	36-28-27	1,484	P.B. 1,462
Texas Co., No. 7 Lehman, Kern Front, Kern Co.	23-28-27	2,125	rig. to pump
Superior Oil, No. 1 Bakersfield, Kern Co.	36-29-28	5,234	dry; abd.
Sunset Oil, No. 1 Union Avenue, Kern Co.	17-30-28	5,915	gr. sd. drlg.
Wilshire Oil, No. 1 F. P., Union Avenue, Kern Co.	36-29-27	3,690	sd. sh. drlg.
Ring Oil, No. 29-2 Bowles, Mount Poso, Kern Co.	29-26-28	1,736	sd. sh. drlg.
C. C. M. Oil, No. 1 Carter, Mount Poso, Kern Co.	7-27-27	1,991	sd. sh. drlg.
Chevalier, J. J., No. 3 S.P., Mount Poso, Kern Co.	3-27-28	1,475	cleaning out
Desert Glow Oil, No. 1 Mount Poso, Kern Co.	14-27-27	1,254	cmtd. 1,230
Hobbee Oil, No. 1 Mount Poso, Kern Co.	14-27-27	1,304	P.B. 1,216
Hub Oil, No. 1 Mount Poso, Kern Co.	8-28-28	3,319	gr. sd. drlg.
Vanguard Oil, No. 7 Baker, Mount Poso, Kern Co.	33-27-28	1,770	sd. sh. drlg.
Shell Oil, No. 19 Security, Mount Poso, Kern Co.	16-27-28	1,682	O.S. drlg.
Shell Oil, No. 12 Vedder-Rall, Mount Poso, Kern Co.	9-27-28	1,784	pump. 259 b.d.
Western Gulf Oil, No. 3-S.W., Fruitvale, Kern Co.	27-29-27	3,442	flow. 470 b.d.
Wilbur, V.R.G., No. 1 Fruitvale, Kern Co.	22-29-27	2,550	sd. sh. drlg.
Sandy Oil, No. 2 Fruitvale, Kern Co.	26-29-27	3,184	sd. sh. drlg.
Pal-Pen Oil, No. 2 Fruitvale, Kern Co.	23-29-27	3,197	rig. to pump
Mohawk Pet., No. 4-23 K.C.L., Fruitvale, Kern Co.	23-29-27	1,996	sd. sh.drlg.
Crude Oil Prod., No. 1 Fruitvale, Kern Co.	21-29-27	4,136	cleaning out
American Expl., No. 1-G Mountain View, Kern Co.	18-30-29	4,792	P.B. 4,722
Savoy Oil, No. 2-W Mountain View, Kern Co.	34-30-29	3,091	sd. sh. drlg.
Tracy Drlg., No. 1-B Mountain View, Kern Co.	19-30-29	1,582	sd. sh. drlg.
Ohio Oil, No. 5-D Mountain View, Kern Co.	33-30-29	5,443	sd. sh. drlg.
Hogan Pet., No. 4 Symons, Mountain View, Kern Co.	5-31-29	6,188	cleaning out
Hogan Pet., No. 3 Bankline, Mountain View, Kern Co.	4-31-29	3,990	sd. sh. drlg.
Greer, P. H., No. 2 Perrel, Mountain View, Kern Co.	9-31-29	3,772	sd. sh. drlg.
Mohawk Pet., No. 4 Earl, Mountain View, Kern Co.	4-31-29	4,740	sd. sh. drlg.
Monterey Expl., No. 6 Duff, Edison, Kern Co.	15-30-28	3,605	P.B. 3,370
North American, No. 4 Brown, Edison, Kern Co.	14-30-29	1,291	sd. sh. drlg.
Cajalco Pet., No. 1 Brown, Edison, Kern Co.	9-30-30	1,154	sd. sh. drlg.
Arkelo Oil, No. 1 Lerdo, Kern Co.	23-28-26	10,050	fish. D.P.
Union Oil, No. 1-34 Rio Bravo, Kern Co.	34-28-25	8,390	br. sh. drlg.
Continental Oil, No. 1 Rosedale, Kern Co.	12-29-26	8,450	hd. sd. drlg.
Standard Oil, No. 11-2 Greeley, Kern Co.	20-29-26	8,339	P.B. 7,725
Standard Oil, No. 11-4 Kreeley, Kern Co.	20-29-26	1,170	sd. sh. drlg.
Standard Oil, No. 11-5 Greeley, Kern Co.	20-29-26	7,620	sd. sh. drlg.
Standard Oil, No. 12-1 Greeley, Kern Co.	30-29-26	7,886	fishing
Union Oil, No. 3 San Emidio, Kern Co.	28-11-22	2,882	sd. sh. drlg.
Shell Oil, No. 21-14 Old River, Kern Co.	14-30-25	8,170	sd. sh. drlg.
Shell Oil, No. 58-29 Ten Section, Kern Co.	29-30-26	5,541	sd. sh. drlg.
Ohio Oil, No. 2-E Ten Section, Kern Co.	6-30-26	5,591	sd. sh. drlg.
Superior Oil, No. 8 Ten Section, Kern Co.	11-30-26	12,490	sd. sh. drlg.
C. C. M. Oil, No. 2-W.P., Midway-Sunset, Kern Co.	28-32-23	2,097	sd. sh. drlg.
C. C. M. Oil, No. 34-21 Midway-Sunset, Kern Co.	21-32-23	2,100	br. sh. drlg.
B-Zone Oil, No. 1 Midway-Sunset, Kern Co.	22-32-23	3,575	br. sd. drlg.
Signal Oil, No. 5-W Midway-Sunset, Kern Co.	8-11-23	975	sd. sh. drlg.
Colby, L. W., No. 1 Midway-Sunset, Kern Co.	12-11-23	1,450	br. sh. drlg.
Ethel D. Oil, No. 43 Midway-Sunset, Kern Co.	36-12-24	640	sd. sh. drlg.
Standard Oil, No. 47-33-D Midway-Sunset, Kern Co.	33-32-24	445	sd. sh. drlg.
Standard Oil, No. 48-33-D Midway-Sunset, Kern Co.	33-32-24	2,880	pump. 453 b.d.
Standard Oil, No. 126-33-D Midway-Sunset, Kern Co.	33-32-24	3,000	sd. sh. drlg.
Shell Oil, No. 3 McKeon, Midway-Sunset, Kern Co.	22-32-23	2,067	O.S. drlg.
Tide Water A. O., No. 5 P.C., Midway-Sunset, Kern	32-31-23	3,131	sd. sh. drlg.
Texas Co., No. 20 Midway-Sunset, Kern Co.	32-32-24	2,944	pump. 224 b.d.
Texas Co., No. 21 Midway-Sunset, Kern Co.	32-32-24	2,870	pump. 134 b.d.
Texas Co., No. 22 Midway-Sunset, Kern Co.	32-32-24	2,291	sd. sh. drlg.
Western Mesa Oil, No. 35 Midway-Sunset, Kern Co.	14-31-22	1,724	dry; abd.
General Pet., No. 49-B Midway-Sunset, Kern Co.	24-31-23	4,495	bailing
Hancock Oil, No. 6 Midway-Sunset, Kern Co.	8-11-23	3,192	rig. to pump
Ninkovich, Gus, No. 2 Ohio, Midway-Sunset, Kern Co.	23-32-23	1,864	dry; abd.
Quality Oil, No. 5-C Midway-Sunset, Kern Co.	22-32-23	965	sd. sh. drlg.
Quality Oil, No. 2-W-P, Midway-Sunset, Kern Co.	27-32-23	1,660	br. sh. drlg.
Honolulu Oil, No. 52 Midway-Sunset, Kern Co.	14-32-24	3,250	O.S. drlg.
Hoyt, Otis, No. 1 Midway-Sunset, Kern Co.	7-11-23	1,617	deepening
Evans, Hugh, No. 16 Midway-Sunset, Kern Co.	35-32-23	2,320	sd. sh. drlg.
Richfield Oil, No. 7-H Crampton, Elk Hills, Kern Co.	1-31-24	1,952	sd. sh. drlg.
Reserve Oil & Gas, No. 33-4 Tejon, Kern Co.	33-11-19	4,415	sd. sh. drlg.
Ohio Oil, No. 2 Tejon, Kern Co.	21-11-19	8,621	br. sh. drlg.

KEY TO ABBREVIATIONS USED IN DRILLING REPORTS

Abd., abandoned.
Bldg., building.
B.D., barrels daily.
B.P., back pressure.
B.R., building rig.
Br. sh., brown shale.
B.S., basic sediment.
C.P., casing pressure.
Cd. or Crd., cored.
C.D., corrected depth.
Cg., coring.
C.L., center line.
Cmtd., cemented.
C.O., cleaning out.
Comp., completed.
Compr., compressor.
C.P., casing pressure, also cement through perforations.
Csg., casing.
D.D., drilling (or drilled) deeper.
Drlg. or Drg., drilling.
Drk. or Dk., derrick.
D.S., drill stem.
D.&A., dry and abandoned.
Fsg., fishing.
Gbo., gumbo.
G.I., gas injection.
Gr., gravity.
Gr. sd., gray sand.
Grn. sh., green shale.
Hd, sd., hard sand.
H.F.W., hole full of water.
I.P., initial production.
L., lime.
L.D.D., later drilled deeper.
Lnr., liner.
Loc., location.
M.I.M., moving in material.
M.I.R., moving in rig.
M.I.R.T., moving in rotary tools.
M.O.T., milling on tools.
O.I.H., oil in hole.
O.S., oil sand.
O.T.D., old total depth.
O.W.D.D., old well drilling deeper.
O.W.P.B., old well plugging back.
P.B., plugging or plugged back.
P.B.P., pulling big pipe.
P.L., pipe line.
P.L.O., pipe line oil.
Pmpg., pumping.
P.O.P., putting on pump.
P.P., pulled pipe.
Rd. sd., red sand.
Rd. sh., red shale.
Recmt., recemented.
Rmg., reaming.
Redrlg., redrilling.
Rng., running.
R.O.G., rig on ground.
R.P., rock pressure.
R.U., rigging up.
R.U.R., rigging up rotary.
R.U.R.T., rigging up rotary tools.
R.U.S.T., rigging up standard tools.
R.&T., rods and tubing.
S. or Sd., sand.
S.D., shut down.
Sd. sh., sandy shale.
Sdtr., or St., sidetracking.
S.D.P.L., shut down for pipe line.
S.D.W.O., shut down awaiting orders.
S.G., show gas.
Sh.&L., shale and lime.
S.I., shut in.
S.I.P., shut in, prorated.
S.L.M., steel line measurement.
S.O., show oil.
S.O.G.&W., show of oil, gas and water.
Spdg. or Spd., spudding.
S.R., straightreaming.
Stdg., standardizing (also standing)
S.W., salt water.
Swbg., swabbing.
T.A., temporarily abandoned.
Tbg., tubing.
T.D., total depth.
T.P., tubing pressure.
Tr., tract.
U.R., underreaming.
W.I.H., water in hole.
W.O., workover.
W.O.C. or W.O.C.S., waiting on cement to set.
W.P., working pressure.
W.S.O., water shutoff.
W.S.O.O.K., water shutoff O.K.
W.S.O.N.G., water shutoff no good.
W.S.R. or W.O.S.R., wait on standard rig.
Wtr., water.

Western Gulf, No. 2 Cantua, Fresno Co.	3-17-15	6,580	abandoning
Union Oil, No. 2 King, Kettleman North, Fresno Co.	29-21-17	8,500	reaming
K. N. D. A., No. 4-18-J Kettleman North, Fresno Co.	18-21-17	10,292	sd. sh. drlg.
K. N. D. A., No. 56-28-J Kettleman North, Fresno Co.	28-21-17	7,819	sd. sh. drlg.
K. N. D. A., No. 67-28-J Kettleman North, Fresno Co.	28-21-17	6,440	br. sh. drlg.
K. N. D. A., No. 78-28-J Kettleman North, Fresno Co.	28-21-17	7,190	recmtd. 7,175
K. N. D. A., No. 2-34-J Kettleman North, Fresno Co.	34-21-17	6,590	br. sh. drlg.
K. N. D. A., No. 32-34-J Kettleman North, Fresno Co.	34-21-17	6,876	br. sh. drlg.
K. N. D. A., No. 61-4-P Kettleman North, Fresno Co.	4-22-17	7,596	sd. sh. drlg.
Standard Oil, No. 41-33-J Kettleman North, Fresno	33-21-17	3,954	sd. sh. drlg.
Standard Oil, No. 81-33-J Kettleman North, Fresno	33-21-17	8,046	sd. sh. drlg.
Standard Oil, No. 4-3-P Kettleman North, Fresno	3-22-17	5,195	sd. sh. drlg.
Standard Oil, No. 78-3-P Kettleman North, Kings	3-22-17	7,775	sd. sh. drlg.
Temblor Oil, No. 1-B Kettleman Middle, Kings Co.	25-23-18	5,935	redrlg. 5,870
Clare, A. S., No. 1 Corcoran, Kings Co.	30-20-22	992	cmtd. 823
Dudley Ridge Dev., No. 2 Dudley Ridge, Kings Co.	24-24-20	781	sd. sh. drlg.
Barnsdall Oil, No. 1 K.C.L., San Luis Obispo Co.	1-32-30	5,217	dry; abd.
Temblor Oil, No. 1 Panorama, San Luis Obispo Co.	22-32-21	1,590	gr. sd. drlg.
Lewis, A. O., No. 1 Pecho, San Luis Obispo Co.	34-30-10	2,652	br. sh. drlg.
Gretna Corp., No. 1 Islay, San Luis Obispo Co.	24-30-10	1,476	sd. sh. drlg.
Shell Oil, No. 1 Pleyto, Monterey Co.	34-24-10	8,994	P.B. 8,750
Shell Oil, No. 2 Pleyto, Monterey Co.	34-24-10	8,628	sd. sh. drlg.
Texas Co., No. 2 Eureka, Humboldt Co.	22- 3-1	7,708	cmtd. 7,395
Amerada Pet., No. 1 Marks, Rio Vista, Solano Co.	24- 4-2	4,450	completing
Tide Water A. O., No. 1 Sargent, San Benito Co.	5-12-4	6,921	P.B. 5,988
Buttes Oilfields, Ltd., No. 1 Kent, Sutter Co.	2-15-1	5,810	fish. D.P.
Jennings, E. P., No. 1 Allensworth, Tulare Co.	4-24-23	2,709	will P.B.

IMPORTANT WELLS AND SOUTHERN CALIFORNIA WILDCATS

Company, well and location—	S.T.R.	Depth	Status
Richfield Oil, No. 1 Elsie, El Segundo, Los Angeles	12- 3-14	170	sd. sh. drlg.
Richfield Oil, No. 1 S.F., El Segundo, Los Angeles Co.	18- 3-14	7,640	completing
Ohio Oil, No. 5 El Segundo, Los Angeles Co.	7- 3-14	1,971	sd. sh. drlg.
Texas Co., No. 2-2 El Segundo, Los Angeles Co.	17- 3-14	7,710	sd. sh. drlg.
Texas Co., No. 2 Security, El Segundo, Los Angeles	18- 3-14	7,263	sd. sh. drlg.
Standard Oil, No. 1 Refy, El Segundo, Los Angeles	13- 3-15	6,895	sd. sh. drlg.
Republic Petroleum, No. 8 El Segundo, Los Angeles	18- 3-14	7,309	hd. sd. drlg.
Signal Finance, No. 1 Hawthorne, Los Angeles Co.	10- 3-14	9,395	cleaning out
Calizoo Oil, No. 1 S.L.A., Los Angeles Co.	16- 3-13	5,042	hd. sd. drlg.
Weber-Butler Oil, No. 2 Torrance, Los Angeles Co.	16- 4-14	4,460	sd. sh. drlg.
McLaren & Assoc., No. 1 Palos Verdes, Los Angeles	27- 4-14	3,992	redrlg. 1,950
Standard Oil, No. 83 Inglewood, Los Angeles Co.	8- 2-14	3,677	flow. 592 b.d.
Shell Oil, No. 90 Reyes, Dominguez, Los Angeles Co.	33- 3-13	9,598	fish. D.P.
Shell Oil, No. 91 Reyes, Dominguez, Los Angeles Co.	33- 3-13	981	cmtd. 976
Union Oil, No. 50 Callender, Dominguez, Los Angeles	33- 3-13	10,435	cleaning out
Union Oil, No. 52 Callender, Dominguez, Los Angeles	33- 3-13	6,700	sd. sh. drlg.
Union Oil, No. 55 Callender, Dominguez, Los Angeles	33- 3-13	3,891	sd. sh. drlg.
Union Oil, No. 7 Carson, Dominguez, Los Angeles	33- 3-13	7,955	sd. sh. drlg.
Union Oil, No. 46 Hellman, Dominguez, Los Angeles	33- 3-13	5,290	flow. 350 b.d.
Union Oil, No. 47 Hellman, Dominguez, Los Angeles	33- 3-13	611	sd. sh. drlg.
Barnsdall Oil, No. 12 O'Dea, Rosecrans, Los Angeles	18- 3-13	6,568	sd. sh. drlg.
Union Oil, No. 16 Rosecrans, Los Angeles Co.	18- 3-13	6,460	sd. sh. drlg.
Universal Consd., No. 1-T Rosecrans, Los Angeles Co.	18- 3-13	4,470	sd. sh. drlg.
Bolsa Chica Oil, No. 1 Rosecrans, Los Angeles Co.	20- 3-13	2,180	sd. sh. drlg.
Metropolitan Oil, No. 1 Playa Del Rey, Los Angeles	34- 2-15	6,331	sd. sh. drlg.
Union Oil, No. 17 D.R., Playa Del Rey, Los Angeles	27- 2-15	6,001	swabbing
Union Oil, No. 18 D.R., Playa Del Rey, Los Angeles	27- 2-15	974	sd. sh. drlg.
Burt, A. G., No. 1 Newhall, Los Angeles Co.	36- 4-17	1,500	sd. sh. drlg.
Barnsdall Oil, No. 1 S.F., Newhall, Los Angeles Co.	26- 4-17	6,472	flow. 200 b.d.
Holbrook Pet., No. 1 Newhall, Los Angeles Co.	28- 4-16	5,390	fish. D.P.
General Pet., No. 3 Ford, Wilmington, Los Angeles	4- 5-13	5,355	deep test
General Pet., No. 6 Ford, Wilmington, Los Angeles	4- 5-13	2,398	sd. sh. drlg.
General Pet., No. 7 Ford, Wilmington, Los Angeles	4- 5-13	3,825	flow. 1,420 b.d.
General Pet., No. 8 Ford, Wilmington, Los Angeles	4- 5-13	3,754	sd. sh. drlg.
General Pet., No. 3-P Wilmington, Los Angeles Co.	4- 5-13	2,555	sd. sh. drlg.
General Pet., No. 3-T Wilmington, Los Angeles Co.	4- 5-13	2,971	sd. sh. drlg.
Hall, Inc., No. 20-7 Wilmington, Los Angeles Co.	33- 4-13	3,100	flow. 410 b.d.
Hall, Inc., No. 484-1 Wilmington, Los Angeles Co.	33- 4-13	137	sd. sh. drlg.
Bankline Oil, No. 29-P.T., Wilmington, Los Angeles	33- 4-13	2,985	sd. sh. drlg.
Bankline Oil, No. 32-P.T., Wilmington, Los Angeles	33- 4-13	2,653	sd. sh. drlg.
Bankline Oil, No. 7-2 Wilmington, Los Angeles Co.	33- 4-13	3,187	sd. sh. drlg.
Burnoel Oil, No. 1-T Wilmington, Los Angeles Co.	33- 4-13	2,810	sd. sh. drlg.
Crude Oil Drlg., No. 1-M Wilmington, Los Angeles	33- 4-13	3,160	sd. sh. drlg.
Holly Dev., No. 1 Wilmington, Los Angeles Co.	33- 4-13	3,581	flow. 412 b.d.
Interstate Inv., No. 1-K Wilmington, Los Angeles Co.	5- 5-13	3,630	flow. 240 b.d.
Jergins Trust, No. 1 Wilmington, Los Angeles Co.	34- 4-13	3,030	recmtd. 3,025
Jergins Trust, No. 2 Wilmington, Los Angeles Co.	34- 4-13	3,042	recmtd. 3,042
Jergins Trust, No. 6 Wilmington, Los Angeles Co.	34- 4-13	1,942	P.B. 600
Jergins Trust, No. 7 Wilmington, Los Angeles Co.	34- 4-13	3,028	sd. sh. drlg.
Jergins Trust, No. 12 Wilmington, Los Angeles Co.	34- 4-13	2,287	sd. sh. drlg.
Midland Pet., No. 5 Wilmington, Los Angeles Co.	5- 5-13	2,988	sd. sh. drlg.
Leal, G. V., No. 1 Wilmington, Los Angeles Co.	33- 4-13	3,492	rig. to pump
Olympic Ref., No. 3 fee, Wilmington, Los Angeles	33- 4-13	3,380	sd. sh. drlg.
O'Donnell, J. E., No. 41 Wilmington, Los Angeles Co.	32- 4-13	2,890	sd. sh. drlg.
Pac. Western, No. 1 Petsec, Wilmington, Los Angeles	33- 4-13	2,871	sd. sh. drlg.
Pac. Western, No. 2 Petsec, Wilmington, Los Angeles	33- 4-13	2,990	sd. sh. drlg.
Pac. Western, No. 1-W Wilmington, Los Angeles Co.	33- 4-13	2,830	sd. sh. drlg.
Packard Pet., No. 20-8-1 Wilmington, Los Angeles Co.	33- 4-13	3,576	sd. sh. drlg.
Packard Pet., No. 20-8-3 Wilmington, Los Angeles Co.	33- 4-13	2,621	sd. sh. drlg.
Ring Oil, No. 3 Wilmington, Los Angeles Co.	33- 4-13	3,605	flow. 730 b.d.
Royalty Service, No. 20-5 Wilmington, Los Angeles	33- 4-13	3,575	flow. 460 b.d.
Royalty Service, No. 7-C Wilmington, Los Angeles	32- 4-13	3,640	flow. 430 b.d.
Royalty Service, No. 23-7-1 Wilmington, Los Angeles	33- 4-13	3,620	flow. 520 b.d.
Royalty Service, No. 3-N Wilmington, Los Angeles	33- 4-13	3,551	flow. 818 b.d.
Royalty Service, No. 1-B Wilmington, Los Angeles	33- 4-13	1,671	sd. sh. drlg.
Selegna Pet., No. 1 Wilmington, Los Angeles Co.	34- 4-13	2,751	sd. sh. drlg.
Sonwell Oil, No. 1 Wilmington, Los Angeles Co.	32- 4-13	3,595	flow. 648 b.d.
Union Pacific, No. 6 Wilmington, Los Angeles Co.	33- 4-13	3,535	flow. 750 b.d.
Union Pacific, No. 11 Wilmington, Los Angeles Co.	4- 5-13	3,915	flow. 996 b.d.
Union Pacific, No. 12 Wilmington, Los Angeles Co.	4- 5-13	3,554	sd. sh. drlg.
Union Pacific, No. 13 Wilmington, Los Angeles Co.	4- 5-13	3,540	sd. sh. drlg.
Union Pacific, No. 14 Wilmington, Los Angeles Co.	3- 5-13	3,934	P.B. 3,661
Union Pacific, No. 15 Wilmington, Los Angeles Co.	34- 4-13	3,474	sd. sh. drlg.
Union Pacific No. 21 Wilmington, Los Angeles Co.	34- 4-13	3,060	sd. sh. drlg.
Union Pacific, No. 24 Wilmington, Los Angeles Co.	4- 5-13	2,621	sd. sh. drlg.
Union Pacific, No. 30 Wilmington, Los Angeles Co.	4- 5-13	971	sd. sh. drlg.
Western States Drlg., No. 2 Wilmington, Los Angeles	33- 4-13	1,540	sd. sh. drlg.
Richfield Oil, No. 2 Ciocca, Montebello, Los Angeles	5- 2-11	3,197	sd. sh. drlg.
Richfield Oil, No. 1 Estrada, Montebello, Los Angeles	5- 2-11	4,682	sd. sh. drlg.
Texas Co., No. 17 Baldwin, Montebello, Los Angeles	6- 2-11	4,394	sd. sh. drlg.
Universal Consd., No. 1-F Montebello, Los Angeles	5- 2-11	5,180	sd. sh. drlg.
Texas Co., No. 21-F Long Beach, Los Angeles Co.	19- 4-12	4,576	sd. sh. drlg.
Jergins Trust, No. 29-M Long Beach, Los Angeles	19- 4-12	2,960	sd. sh. drlg.
Clayton, G. L., No. 1 North Long Beach, Los Angeles	32- 3-12	5,050	idle
General Pet., No. 27 Santa Fe Springs, Los Angeles	5- 3-11	4,695	sd. sh. drlg.
Union Oil, No. 100 Santa Fe Springs, Los Angeles Co.	6- 3-11	10,789	fish. D.P.
Standard Oil, No. 28 S.G., Seal Beach, Orange Co.	11- 5-12	6,070	reaming
Tide Water A. O., No. 16-B Seal Beach, Orange Co.	11- 5-12	4,290	sd. sh. drlg.
Lucky Strike Oil, No. 8 Huntington, Orange Co.	2- 6-11	2,630	redrlg. 2,330
Holly Oil, No. 7-A Huntington, Orange Co.	35- 5-11	4,060	pump. 75 b.d.
Texas Co., No. 9 Brown, Huntington, Orange Co.	11- 6-11	3,832	reaming
Tide Water A. O., No. 55 M. K., Huntington, Orange	2- 6-11	3,615	sd. sh. drlg.
West American, No. 14 Huntington, Orange Co.	34- 5-11	4,207	sd. sh. drlg.
Orco Oil, No. 5 Huntington, Orange Co.	2- 6-11	4,697	redrlg. 3,498
Standard Oil, No. 14 Thomson, Huntington, Orange	12- 6-11	650	sd. sh. drlg.
Union Oil, No. 9-C Huntington, Orange Co.	34- 5-11	3,715	sd. sh. drlg.
Commander Oil, No. 1 Newport, Orange Co.	29- 6-10	7,586	br. sh. drlg.
Shell Oil, No. 4-1 Columbia, Olinda, Orange Co.	9- 3-9	1,593	sd. sh. drlg.
Hogan Pet., No. 1 McNally, West Coyote, Orange Co.	23- 3-11	6,231	dry; abd.
Bandini Petroleum, No. 1-B East Coyote, Orange Co.	24- 3-10	3,990	O.S. drlg.
Bartholomae Oil, No. 4 East Coyote, Orange Co.	22- 3-10	3,797	sd. sh. drlg.
Kelly, Thomas, No. 11 East Coyote, Orange Co.	24- 3-10	3,725	sd. sh. drlg.
Union Oil, No. 20 Hole, East Coyote, Orange Co.	22- 3-10	5,352	sd. sh. drlg.
Standard Oil, No. 2-10 East Coyote, Orange Co.	22- 3-10	4,025	sd. sh. drlg.
Arrowhead Oil, No. 1-B Richfield, Orange Co.	29- 3-9	2,530	sd. sh. drlg.
Joseph, Arthur, No. 1 Richfield, Orange Co.	29- 3-9	3,740	P.B. 3,710
Union Oil, No. 10 Morse, Richfield, Orange Co.	29- 3-9	2,990	sd. sh. drlg.
Union Oil, No. 9 Coyle, Richfield, Orange Co.	29- 3-9	3,101	sd. sh. drlg.
Principal Oil, No. 1 Richfield, Orange Co.	36- 3-9	2,554	sd. sh. drlg.
Richfield Consd Oil, No. 1 Yorba, Orange Co.	22- 3-9	871	sd. sh. drlg.
Signet Oil, No. 1 Yorba, Orange Co.	21- 3-9	962	sd. sh. drlg.
West American Oil, No. 1 Tustin, Orange Co.	14- 5-9	3,352	hd. sd. drlg.

KANSAS

Week Ending May 29 (Descriptions are East unless marked otherwise)

Barber County

Barbara Oil Co. No. 1-27 Holmes, C NW NW sec. 27-33-13w. Drlg. 776 ft.

Pryor & Lockhart No. 1 Gant, C SE sec. 7-31-13w. Drlg. 2,323 ft.

Barton County

S. E. Bailey No. 1 Hammeke, NE NE SW sec. 12-18-12w. O.W.D.D.; S.D. 2,100 ft.

George Dickey et al No. 1 Boger, SE SE NE sec. 15-16-13w. H.F.W. 3,386-89 ft.; D.&A.

J. B. Hanna No. 1 Luce, SW cor. sec. 21-20-13w. R.U.R.

Magnolia Pet. Co. No. 1 Zink, NW NW SE sec. 13-18-11w. Sil. 3,300 ft.; T.D. 3,600 ft.; D.&A.

Sam Murphy No. 1 Beck, NE cor. sec. 17-17-12w. Rlg.

C. L. Price et al No. 1 Kraft, SW NW NE sec. 10-17-11w. Sil. 3,281 ft.; T.D. 3,-288½ ft.; pot. 1,904 bbls.; comp.

Republic Nat. Gas Co. and Continental Oil Co. No. 1 Moeder, NE NE SW sec. 25-17-13w. Drlg. 2,130 ft.

Stanolind O. & G. Co. No. 1 Struder, SE SE SW sec. 26-16-13w. Sil. 3,402 ft.; cg.

E. F. Wakefield et al No. 1 Scheuerman, NE NE SW sec. 31-16-15w. Sil. 3,550 ft.; T.D. 3,580 ft.; D.&A.

Butler County

Kahn et al No. 1-A Madden, SW SW NE sec. 27-23-4. K.C. 2,065 ft.; T.D. 2,212 ft.; pot. 30 B.O. with 60 B.W.

Simpson Oil Co. et al No. 1-A Dennis, NE NE SW sec. 15-26-6. Drlg. 840 ft.

Maurer & Saco Oil Co. No. 1 Connell, NE NE SW sec. 27-29-5e. R.U.

Vickers Pet. Co. No. 1 Voth, C N½ NE NE sec. 32-24-4e. Misner 3,137-43 ft.; S.D.

Chase County

Propp et al No. 1 Fromm, SE cor. sec. 29-18-9e. L. 2,510 ft.; T.D. 2,803 ft.; D.&A.

Chautauqua County

C. L. Brosius et al No. 1 Garrett, NW SW NW sec. 26-32-11. Spdd.

Buffington and Cohen No. 1-A Hayes, SE NE SE sec. 10-33-13. Miss. 1,537 ft.; rng. 6-in.

Robinson et al, No. 1 Foster, SW cor. sec. 6-33-12. Drlg. 1,325 ft.

Ira Scott et al No. 1 Lamba, SW NW NE sec. 18-33-13. Drlg. 1,530 ft.

E. J. Shaffer No. 1 Nuckolls, NW cor. sec. 12-33-19. Miss. 2,360 ft.; drlg. 2,560 ft.

Cowley County

B. B. Blair et al No. 1 Miller, NE NW SW sec. 14-32-5. Drlg. 1,285 ft.

Bess & Gralapp et al No. 1 Wakefield, NE SE SW sec. 18-30-6. Miss. 2,939 ft.; T.D. 3,035 ft.; D.&A.

Elmer Ash et al No. 1 Bolack, NW NW SE sec. 22-32-6. Sd. 2,895 ft.; Miss. 3,-090 ft.

Murta & Wilson No. 1 Turner, NE NE NW sec. 30-32-6. Drlg. 1,930 ft.

McCoy et al No. 1 Anderson, SE NW NE sec. 34-34-6. Fsg. 1,685 ft.

Palmer et al No. 1 Ogrosky, SE SE NW sec. 31-32-5. Drlg. 1,660 ft.

Trees Oil Co. No. 1 Hornbeck, NW cor. sec. 5-33-4. R.U.

Tulsa Oil Co. et al No. 1 Dillon, NW NW NE sec. 28-34-3. Rig.

Decatur County

C. L. Bruce et al No. 1 Newbold, C NE SE sec. 34-2s-28w. R.U.R. and S.D.

Edwards County

Royal Pet. Co. et al No. 1 Krupp, NW NW SE sec. 18-24-19w. Drlg. 4,693 ft.

Elk County

G. T. Berry No. 1 Zimmerman, SW NE SE sec. 15-30-10. Drlg. 491 ft.

Republic Nat. Gas Co. No. 1 Glasscock, SE NE SW sec. 19-31-11. Drlg. 243 ft.

Ellis County

Austin Drlg. Co. No. 1 Karlin, NW cor. sec. 13-12-18w. Rlg.

Billings No. 1 Smith, SE SE NW sec. 14-12-16w. Drlg. 2,627 ft.

Bridgeport Machine Co. et al No. 1 Froelick, NW NW SE sec. 4-13-16w. Pay 3,-260-65 ft.; acd.; swb. 232 B.O. in 3 hrs.

Elwell and Tree Oil Co. No. 1 Wickham, SW SW NE sec. 10-11-19w. Sil. 3,645 ft.; T.D. 3,654 ft.; D.&A.

Lario O. & G. Co. et al No. 1 Henderson, SW SW NE sec. 27-11-18w. K.C. 3,273 ft.; rng. 6-in. 3,437 ft.

J. J. Muth No. 1 Penney, NW SE SE sec. 29-14-18w. S.D. 1,115 ft.

Noble Pet. Corp. No. 1 O'Laughlin, NW NW SE sec. 13-12-19w. Sil. 3,900-43 ft.; T.D.; wtr.; S.D.O.

J. C. Shaffer, Inc., No. 1 Staab, SE cor sec. 25-12-18w. Sil. 3,828-41 ft.; T.D.; D.&A.

Twin Drlg. Co. et al No. 1 Craig, NE NE SE sec. 6-11-16w. Cong. 3,456 ft.; drlg. 3,500 ft.

Earl Wakefield et al No. 1 Burnett, NW NW NE sec. 1-11-18w. Rig.

Ellsworth County

Frost et al No. 1 Dolechek, NE NE SW sec. 36-14-8w. Drlg. 3,390 ft.

Orville Lea No. 1 Larkin, NW cor. sec. 15-16-8w. H.F.W. 2,530-50 ft.; U.R. 8-in.

Greenwood County

B. & B. Oil Co. No. 1 Webb, C NE SE sec. 3-26-13. Fsg. 1,115 ft.

Ward McGinnis et al No. 1 Henly Estate SW cor. sec. 25-25-9. Drlg. 1,670 ft.

Western Kansas O. & R. Co. No. 1 Taylor, SE SE SW sec. 6-27-12. Spd.

Hamilton County

Denver Prod. & Ref. Co. No. 1 Porter, SW SW NE sec. 30-25-41w. Drlg. 3,-068 ft.

Harper County

Carter Oil Co. et al No. 1 Seihart Est., C SW NW sec. 4-34-8w. Sil. 5,202-29 ft.; set 6-in. 4,680 ft.

Harvey County

Bell O. & G. Co. et al No. 1 Austin, SE NE NE sec. 28-23-1e. Rlg.

Hollow & Bradley Bros. No. 1 Neufeldt, NE SE NW sec. 7-22-1w. Drlg. 269 ft.

E. I. Shaffer et al No. 1 Epp, SE cor. sec. 15-23-3w. Rig.

Shaffer & Shawver No. 1 Hege, NE NE SE sec. 26-22-2w. Chat 2,983-3,027 ft.; T.D.; D.&A.

Simpson & Noble et al No. 1 Pierce, SW SE NE sec. 25-22-2w. Drlg. 365 ft.

Kearny County

J. L. Murphy No. 1 Masonic Home, C NW sec. 1-26-36w. Drlg. 500 ft.

Logan County

W. H. Boucher No. 1 Wright, C SE SE sec. 12-15-35w..Miss. 4,655 ft.; S.O. 4,-850-60 ft.; drill pipe stuck 4,910 ft.

Lyon County

Davis & Sory No. 1 Byrd, SW SW SE sec. 32-21-11. S.D. 590 ft.

Young et al No. 1-A Murphy, SE NW NE sec. 32-21-11. Sd. 1,940 ft.; T.D. 1,981 ft.; D.&A.

McPherson County

C. E. Ash Drilling Co. No. 1 Broman, NE NE NW sec. 19-17-4w. Rig.

Bradley Bros. No. 1 Barnholt, SW SW SE sec. 30-30-5w. K.C. 2,720 ft.; drlg. 2,-875 ft.

Fred C. Frank et al No. 1 Doles, SE NW NE sec. 12-19-1w. Drlg. 950 ft.

Smith et al No. 1 Larson, NW NW SW sec. 35-18-5w. Drlg. 2,155 ft.

Wamhoff et al No. 1 Nuse, SE NE SW sec. 18-18-4w. Set 10-in. 110 ft.; W.O.C.

Mitchell County

Geo. Siedhoff et al No. 1 Greiss, SW SW SE sec. 16-8-10w. Drlg. 3,200 ft.

Ness County

Jones & Lane No. 1 Page Milling Co., SE SE NW sec. 36-18-26w. Rig.

Newton Dev. Co. No. 1 Tenny, NW NW SE sec. 19-18-25w. S.D. 4,379 ft.

Osborne County

J. E. Waldron No. 1 Neuschwanger, SE NE NW sec. 11-8-14w. Spd. and S.D.

Pratt County

Atlantic Ref. Co. et al No. 1 Runyon, SW NW NE sec. 11-27-13w. R.U.R.

Reno County

Imo O. & G. Co. and others No. 1 Watkins, SE cor. sec. 14-22-7w. Drlg. 1,700 ft.

Clyde Pulse No. 1 Payne, SW NW SE sec. 4-22-7w. Set 6-in. 3,243 ft.; W.O.C.

Sinclair Prairie Oil Co. No. 1 Natt, NW NW SE sec. 32-26-4w. Sil. 4,156-84 ft., T.D.; D.&A.

Rice County

Comanche Oil Co. No. 1 Cramm, SW SW SE sec. 15-19-9w. Set 8-in. at 2,288 ft.
L. E. Douglass No. 1 Coyne, NE SE SE sec. 24-21-8w. Shot 3,374-3,436 ft.; 300 ft. W.I.H. and S.O.
John Hanna et al No. 1 Fulton, NW NW NE sec. 24-10-6w. 5 B.W. 3,220-30 ft.; set 6-in. 3,348 ft.
Hipple et al No. 1 Wernet, NE NE NW sec. 11-20-6w. Drlg. 2,310 ft.
Fred Phillips et al No. 1 Hubenett, SW NW SW sec. 23-20-6w. C.O. 3,198 ft.
Shell Pet. Corp. et al No. 1 Haxton B, NE NE SW sec. 29-18-9w. Sil. 3,271 ft.; cg.
C. E. W. Skiles et al No. 1 Helmer, NW NW NE sec. 7-19-18w. Drlg. 1,825 ft.
Stanolind O. & G. Co. No. 1 Mooney, NE NE SW sec. 5-19-10w. Drlg. 2,238 ft.
Union Oil & Refining Co. et al No. 1 Baker, SW SW NE sec. 33-20-6w. S.O. 3,432-36 ft.; wtr. 3,436-40 ft.; U.R.
W. E. Witt et al No. 1 Fair, NW SE SE sec. 4-22-8w. Rng. 10-in. 1,890 ft.

Rooks County

Basin Oil Co. No. 1 Baxa, NE cor. sec. 23-9-17w. Simp. 3,620-20 ft. T.D.
Brunson Drlg. Co. et al No. 1 Casey, SE SE NE sec. 22-9s-16w. Drlg. 2,705 ft.
C. R. Craft et al No. 1 Ziegler, NE NE SW sec. 8-10-16w. Topeka 2,850-60 ft.; R.U. S.T.
Graham et al No. 1 Fike, SW cor. sec. 9-9-17w. T.D. 3,304 ft.; small inc. in oil.
S. C. Hoel et al No. 1 Ives, SW SW NE sec. 11-7-18w. Set 12-in. 1,060 ft.; C.O.
Jones Bros. No. 1 Wiss, NW cor. sec. 8-10-18w. K.C. 3,473 ft.; S.D. 3,509 ft.
J. H. Lester No. 1 Methene, SE SE NE sec. 29-10-20w. Fsg. 3,818 ft.

Rush County

Carter Oil Co. et al No. 1 Brosch, C N½ N½ SE sec. 21-18-16w. Drlg. 385 ft.
Duwe & Brouk No. 1 Lebsack, SE SE NE sec. 13-16-16w. Drlg. 2,389 ft.
S. A. Murphy et al No. 1 Roth, NW NW SW sec. 21-16-18w. Drlg. 3,635 ft.
Westgate-Greenland Oil Co. et al No. 1 Greenwalt, NW NW NE sec. 19-19-16w. Drlg. 3,710 ft.

Russell County

Aylward et al No. 1 Jones SE SE NW sec. 23-14-13w. Fsg. 2,285 ft.

Billings et al No. 1 Boxberger, NE NE SE sec. 21-14-14w. R.U.
Equity Gas Co. No. 1 Harbaugh, NW NE SW sec. 19-13-12w. Topeka 2,830 ft.; Dodge 2,938 ft.; drlg. 2,950 ft.
Goldstein and Vernon Oil & Gas Co. No. 1 Steinert Estate, NE SE NW sec. 34-15-15w. Drlg. 2,230 ft.
S. M. Murphy et al No. 1 Deines, SE SE SW sec. 36-15-15w. Topeka 2,875 ft.; S.D. 3,075 ft.

Scott County

Olson Drlg. Co. et al No. 1 Nolan, NW NW NE sec. 13-19-33w. K.C. 4,220 ft.; circ. 4,777 ft.

Sedgwick County

Cameron et al No. 1 Smith, SW SE SE sec. 13-27-2e. Sil. 3,230-72 ft.; P.B. 2,388 ft.
Roxana Drlg. Co. et al No. 1 Woodman, SW NW SW sec. 26-26-1w. S.D. 2,469 ft.
E. B. Shawver No. 1 Furman, SW NE SE sec. 24-29-3w. Drlg. 615 ft.

Stafford County

Atlantic Ref. Co. No. 1 Kachelman, SE NW NW sec. 13-25-14w. R.U.R.
W. P. Faulkner No. 1 Schulz, SE SE NE sec. 6-22-13w. R.U.
Rose Spring Drlg. Co. et al No. 1 Gray, NW cor. sec. 11-24-13w. R.U.R.

Sumner County

John Burton et al No. 1 Springate, NE NE SW sec. 30-33-2e. Rig.
Glimac Oil Co. et al No. 1 Proud, SW SE SE sec. 33-30-1w. Miss. 3,591 ft.; R.U.S. T. 3,631 ft.
Graham et al No. 1 Dawson, NW NW NW sec. 4-33-2w. Base Miss. 4,250 ft.; fsg. 4,255 ft.
Texas Co. No. 1 Harper, NE SW SE sec. 9-20-3w. Simp. 4,264 ft.; U.R. 6-in. 4,-390 ft.

Trego County

W. I. Southern, Inc., No. 1 Latimer, NW NW SE sec. 19-15-22w. Topeka 3,460 ft.; K.C. 3,725-37 ft.; run 8-in.

Woodson County

M. B. Allen No. 1 Flack, NE NE NW sec. 1-26-14. Sd. 1,313-42 ft.; T.D. 2,300,000 ft. gas.
B. & B. Oil Co. No. 1 Lockard, NW NW NE sec. 2-26-13e. Machine.
Morris et al No. 1 Koening, SE SE NW sec. 35-24-15. Drlg. 400 ft.

Summit Drlg. Co. et al No. 1 Whittaker, NW NE SE sec. 31-4-6. Drlg. 2,670 ft.
Union Dev. Co. No. 1 Abbott, SW NW NE sec. 34-3-6. Drlg. 250 ft.

Pottawatomie County

Atlantic Ref. Co. No. 1 Doolev, SE SE SW sec. 9-11-5. Set 12½-in. 190 ft.; T.D. 205 ft.
Mid-Continent Pet. Corp. No. 1-A Logan, NE NE SE sec. 31-11-5. Wilcox 4,839 ft.; T.D. 4,844 ft.; P. 200 B.O. and 80 B.W.; comp.
Mid-Continent Pet. Corp. No. 1 Ne-Thah-Pea-Se, SE SE NE sec. 24-11-4. Drlg. 1,080 ft.
Stanolind O. & G. Co. and Amerada Pet. Corp. No. 1 Billington-B, SW SE SW sec. 32-9-3e. Belle City 2,990 ft.; drlg. 3,235 ft.

Pushmataha County

Erle Halliburton et al No. 1 Bagwell, SW NE NE sec. 30-3s-15e. Cg. 2,065 ft.

Seminole County

Amerada Petroleum Corp. and Stanolind Oil & Gas Co. No. 1 Reed, SE SW SE sec. 19-10-8. T.D. 3,618 ft.; D.&A.

Texas County

Cabot Carbon Co. No. 1 Calvert, C sec. 14-3n-16ecm. Drlg. 2,643 ft.
Cabot Carbon Co. No. 1 Castro, C SE sec. 19-3n-17ecm. T.D. 2,570 ft.; 3,600,000 ft. gas at 2,690 ft.; plugging back.
Missouri Valley Gas Corp. No. 1 well, C sec. 17-6n-14ecm. S.D. 2,257 ft.

Washita County

John Koberg No. 1 Harms, NW NW NE sec. 6-10-16w. Drk.
L. P. McWhirter No. 1 fee, NW SW SW sec. 34-8-19w. T.D. 1,810 ft.; S.D.

SOUTHERN OKLAHOMA

Carter County

Shell Pet. Corp. No. 1 Smith, NW SE NE sec. 30-5s-1e. R.U.R.

Comanche County

E. B. Hane No. 1 Duper, NW cor. sec. 21-2n-13w. S.D. 250 ft. for csg.
Frank Scott No. 1-A Kuntz, SE NE SE sec. 21-4n-11w. T.D. 2,450 ft.; S.D.

Jackson County

Ace Gutowsky No. 1 Howard, NE SW NW sec. 10-3n-19w. Drlg. 300 ft.

Jefferson County

Heenan & Coe et al No. 1 Rose, C SW SW sec. 1-5s-5w. T.D. 5,024 ft.; D.&A.
Massad & Swansberger No. 1 Barrett, NE cor. SE SE sec. 14-6s-6w. T.D. 1,842 ft.; S.D.

Love County

Sinclair Prairie Oil Co. No. 1 Stocktor SE SE SW sec. 26-6s-2w. T.D. 8,583 ft.; P.B. 6,927 ft.; set 5½-in. 6,624 ft.; W. O.C.

Marshall County

Stuart & Taylor No. 1 Chestnut, NE cor sec. 23-8s-5e. T.D. 788 ft.; P.B. 787 ft tstd. 30 B.O. and 6 B.W. in 24 hrs.; S.D.

Murray County

O. O. Owens No. 1 Fryer, NE SE NE sec 34-1s-3e. Hunton 1,425 ft.; Sylvan 1,-655 ft.; drlg. 1,812 ft.
Power Oil Co. et al No. 1 Lancaster Trust C SW NE sec. 10-1s-2e. T.D. 3,438 ft.; P.B. to 3,175 ft.; S.D.
J. Ben Russell No. 1 fee, SE SE NW SE sec. 9-2s-3e. Drlg. 2,134 ft.

Stephens County

Wm. Angle No. 1 Lang, SW SW NE sec 24-1n-7w. T.D. 3,525 ft.; S.D.
Carter Oil Co. No. 1 Harley, C NE NE sec. 24-2s-4w. Drlg. L. 5,545 ft.
H. J. Edwards No. 1 Frederick, SW cor NE SE NW sec. 31-2n-8w. T.D. 2,754 ft.; D.&A.
Helmerich & Payne No. 1 Graham, SW SW NE sec. 12-1n-5w. T.D. 5,014 ft.; M.I.R.T.
Charles Newsom No. 1 Pfile, SW cor. sec. 1-2s-7w. Set 10-in. csg. 115 ft.; T.D.
Geo. L. Pace et al No. 1 Tah-Su-Dah, SE NW SW sec. 27-1s-9w. T.D. 2,707 ft.; Schlumberger test; wtr.; S.D.O.

Tillman County

Cavens et al No. 1 Southerland, SW SW NW sec. 35-4s-16w. R.U.R.
Lynn Oliver No. 1 Relling, SE SE NW sec. 22-1s-15w. T.D. 1,387 ft.; D.&A.
Magnolia Pet. Co. No. 1 Brown, SW SE NE sec. 21-3s-18w. Canyon 3,480 ft.; Strawn 4,335 ft.; drlg. 6,145 ft.

OKLAHOMA

Week Ending May 29

NORTHERN OKLAHOMA

Alfalfa County

Olson Drlg. Co. et al No. 1 Acre, C SW NE sec. 14-24-11w. O.W.P.B.; fsg. 3,-700 ft.

Beckham County

Carter Oil Co. No. 1 Bingham, NE cor. sec. 31-8-26w. Drlg. 1,928 ft.
Carter Oil Co. No. 1 Porter, C SW SW sec. 36-10-25w. T.D. 3,635 ft.; W.O.C.
Mid-American Oil Co. No. 1-A Biscoe, SW cor. sec. 28-8-22w. Fsg. 1,945 ft.

Caddo County

Clyde Becker et al No. 1 Pharris, SE SE NW sec. 24-6-12w. Drlg. 800 ft.

Cleveland County

W. R. Hollenbeck No. 1 Norman, NW NW NE sec. 17-9-2w. T.D. 6,195 ft.; S.D. for wtr.

Creek County

M. W. Mosier et al No. 1 Holcomb, SE SW NW sec. 19-18-8. T.D. 2,935 ft.; drlg. on iron.

Garfield County

Ohio Oil Co. No. 1 State, SW cor. sec. 13-23-3w. Tyner 4,780 ft.; drlg. 4,870 ft.

Grant County

Carter Oil Co. et al No. 1 Crisman, C W½ SW NW sec. 16-25-3w. Rig.
Carter Oil Co. et al No. 1 Kolarik, NW SW sec. 4-26-5w. R.U.R.

Greer County

Nelf-Godfrey-Andrea No. 1 Melton, SE NW SE sec. 16-22w. T.D. 4,522 ft.; D.&A.

Haskell County

Continental Oil Co. No. 1 Ferguson, SW SE NE sec. 33-8-20. Drlg. 4,080 ft.

Harmon County

Penn State Oil Co. No. 1 Cole, C W½ SW NW sec. 21-2n-26w. T.D. 5,575 ft.; D.&A.

Hughes County

C. E. Beal No. 1 Eason, NE NE NW sec. 7-9-11. Drlg. 1,240 ft.
Cap Rock Oil Co. No. 1 Parks, SW SW SE sec. 34-7-8. Drlg. 4,020 ft.
E. H. Moore, Inc., No. 1 Buck, NW SW SW sec. 21-8-10. Booch 2,310 ft.; T.D. 2,725 ft.; to run 10-in.

Kay County

Higdon et al No. 1 Nieman, NE NW NE sec. 9-26-3e. T.D. 519 ft.; fsg.

Kiowa County

Argus Pet. Co. No. 1 Osborne, NW cor. NE sec. 9-7-16w. T.D. 1,275 ft.; bailing and C.O.
Kiowa Oil Corp. No. 1 Finder, C SW NE sec. 4-6-20w. T.D. 130 ft.; S.D.

Latimer County

Clark Drlg. Co. et al No. 1 Wilson, C SE SE sec. 15-5-18. Drlg. 5,448 ft.

Lincoln County

Exchange Drlg. Co. No. 1 Dowell, SE SE NW sec. 10-14-6. Prue 3,006-57 ft.; good S.O.; T.D. 3,065 ft.; to shoot.

Logan County

Anthony & Marshall No. 1 Fruin-Eckman, SE SE SW sec. 4-16-1e. T.D. 4,975 ft.; wating on new cable.
Eason Oil Co. et al No. 1 Sisters, SW cor. sec. 24-17-1w. First Wilcox 5,402 ft.; drlg. 5,423 ft.
Helmerich & Payne et al No. 1 Randall, SW SW NW sec. 24-16-1w. Layton 3,572-3,640 ft.; drlg. 4,297 ft.

Noble County

Lincoln Oil Co. et al No. 1-A Neil, NE cor. sec. 15-23-2w. Wilcox 4,681 ft.; T.D. 4,826 ft.; fsg.
Magnolia Pet. Co. No. 1 Forsythe, SE SE SW sec. 23-21-2w. First Wilcox 5,275 ft.; cg. 5,293 ft.
Stanolind O. & G. Co. and Amerada Pet. Corp. No. 1 Johnson, NW NW SE sec. 4-20-2w. Drlg. 1,475 ft.
Summit Drlg. Co. et al No. 1 Dolezal, SE SE SW sec. 8-22-1w. Miss. 4,845 ft.; drlg. 4,965 ft.

Oklahoma County

Sunray Oil Co. No. 1 Dickson, NW cor. sec. 17-11-1e. M.I.T.

Osage County

Helmerich & Payne et al No. 1 Osage, NE NE SW sec. 13-23-6. Miss. 2,823 ft.; T.D. 2,825 ft.; D.&A.
Midco Oil Corp. No. 1 Osage, SE SE NW sec. 22-23-6e. T.D. 1,320 ft.; underdigging 10-in.

Pawnee County

Carter Oil Co. No. 1 Wells, C E½ SE NW sec. 30-23-5. Drlg. 415 ft.

Payne County

Bill Riddle No. 1 Van Zandt, NW NW SE sec 16-18-3e. Drlg. 2,300 ft.

Pontotoc County

Boettcher O. & G. Co. No. 1 Cann, SE NW NE sec. 25-4n-7e. Drlg. 800 ft.
Caloma Oil Co. No. 1 Brentz, SE NE SW sec. 4-1n-6. T.D. 1,010 ft.; S.D.
Clark Drlg. Co. et al No. 1 Richardson, SE SE NW sec. 30-4-8. Spd.
Norbla Oil Co. No. 1 Kennedy, SE SE NE sec. 13-2-5. Spd.
Papoose Oil Co. et al No. 1 Jones, NW SE NW sec. 2-4-5. Viola 2,595 ft.; T.D. 2,-840 ft.; run Schlumberger; S.D.O.
Roodhouse et al No. 1 Booth, SE NW SE sec. 20-2-6. Drlg. 2,770 ft.
Southern Oil Co. No. 1 Young, NE NE SE sec. 17-3-7. Machine.

LOUISIANA

NORTH LOUISIANA PROVEN

Caddo—Rodessa

Drillers, Inc., No. 1 Glassell-Means, SW NE SE sec. 9-23-15. T.D. 6,076 ft.; tstg.
J. E. Jones No. 1-A Parker, SW cor. sec. 4-23-16. Drlg. 1,000 ft.
R. W. Norton No. 3 L. C. Harden, SW sec. 17-23-16. Comp.; flw. 85 bbls. in 4 hrs.; T.D. 5,956 ft.
R. W. Norton No. 1 Payne, C SE SE sec. 27-23-16. Cg. 9,831 ft.
R. W. Norton No. 5 Starke, SW sec. 17-23-16. Drlg. 4,959 ft.
R. W. Norton No. 6 Starke, NE sec. 17-23-16. R.U.
Standard Oil of La. No. 3 Armistead Comm., SE SE SE sec. 4-23-16. Drlg. 5,705 ft.
Standard Oil Co. No. 2 L. J. Kaempfer, NE NW SW sec. 9-23-16. 7-in. 5,897 ft.; T.D. 5,903 ft.
Standard Oil Co. No. 2 Sarah Kaempfer, SW SW NE sec. 9-23-16. Drlg. 5,403 ft.
Standard Oil Co. No. 3 Sarah Kaempfer, NW NW SE sec. 9-23-16. Drlg. 4,000 ft.
Surf Oil Co. No. 1 Allison, NE sec. 8-23-16. Drlg. 1,890 ft.
Surf Oil Co. No. 1 Upchurch, NE sec. 8-23-16. R.U.
United Gas No. 6 fee 574, SW NE NW sec. 16-23-16. Comp.; flw. 11 B.P.H.; T.D. 5,992 ft.
United Gas No. 7 fee 574, SW NW sec. 16-23-16. R.U.
United Gas No. 8 fee 574, NW cor. sec. 16-23-16. Loc.
United Gas No. 11 Pitts Unit, SE NW sec. 13-23-16. Drlg. 5,265 ft.
United Gas No. 2 Starke, C SW SW sec. 9-23-16. Drlg. 2,068 ft.
United Gas No. 5 Young, NW sec. 27-23-16. T.D. 6,790 ft.; hole clean; W.O.

N. LOUISIANA WILDCATS

Bienville Parish

DeSota O. & G. Co. No. 1 Ashley, SW SE sec. 15-16-10w. 10-in. cmtd. 2,100 ft.; W.O.C.S.
Hunt Oil Co. et al No. 1 Bodcaw, SE sec. 30-14-5w. R.U.
Lide & Greer No. 1 W. J. Smellev, SE NW SW sec. 18-16-4w. Drlg. 7,036 ft.

Bossier Parish

Arkansas-La. No. 2-B Werner, NE cor. sec. 7-17-11. Drlg. 3,177 ft.
Ray P. Overiess et al No. 1 Birenhern, NW NW NE sec. 23-21-14. S.D. 98 ft.
Premier Inv. Co. No. 41 Wyche, SE NW NW sec. 14-19-11. Comp.; pmp. 10 B.P. D.; T.D. 243 ft.
Producers O. & G. Co. No. 1 Hill Est., E½ NE¼ sec. 8-17-11. S.D. 1,090 ft.; rig repair.
Producers O. & G. No. 1 R. Johnson, NE sec. 5-17-11. Drlg. 3,750 ft.
Triangle Drlg. Co. No. 1 C. Howell, NW sec. 26-17-12. Drlg. 200 ft.
United Gas No. 1 S. L. Herold, 660 ft. S and W, NE sec. 31-17-4. Drlg. 2,666 ft.
United Gas No. 1-A Jeter Unit, SW sec. 24-17-12. Drlg. 3,578 ft.
United Gas No. 3 L. Schmitt, NW sec. 14-17-12. M.I.M.
United Gas No. 2-I H. C. Skannal, SW sec. 25-17-12. Drlg. 4,425 ft.

Hoard Exploration Co.

Seismograph Surveys

618 Esperson Bldg.

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Caddo Parish

J. G. Abney No. 1 Thigpen & Herold, NW SW sec. 15-21-15. T.D. 1,060 ft.; arg. test.
W. D. Ambrose No. 1 Pender, NW NE SW sec. 11-20-15; 10-in. cmtd. 60 ft.
Calatex O. & G. No. 3-A Agurs, SW cor. sec. 6-16-6. Drlg. 2,466 ft.
Chew & Chew No. 1 Standard Oil, SE sec. 32-21-16. Drlg. 635 ft.
Paul Cooper No. 2 Rodgers, NW SW SW sec. 11-20-15. 6-in. 2,185 ft.; T.D. 2,204 ft.
T. B. Donnell No. 4 Stokeley, SW sec. 5-20-16. 6-in. cmtd. 950 ft.; W.O.C.S.
T. B. Donnell No. 5 Stokeley, SW sec. 5-20-16. Loc.
W. J. Hunter et al No. 1 Stoer, NW SW NE sec. 10-15-15. Cg. 5,320 ft.
F. L. Luckett No. 1 Connell, SW NE sec. 10-20-15. 6-in. cmtd. 2,174 ft.; T.D. 2,203 ft.; prep. to test.
Tom Pappas No. 2 Spell, SW sec. 28-21-15. Drlg. 820 ft.
W. L. Porter No. 1 Terbune, sec. 15-21-16. T.D. 980 ft.; prep. D.D.
Prairie River Synd. No. 1 Hutchinson, SW NW sec. 15-15-12. Milling on 7-in.; T.D. 7,757 ft.
Shreveport Oil Corp. No. 2-D Munslow, SE sec. 5-20-15. P.B. 2,218 ft. to 2,190 ft.; W.O.C.S.
Simplex Oil Co. No. 11 Glassell, NE SW sec. 10-20-15. Loc.
Simplex Oil No. 5-A Natalee, NE NW SE sec. 10-20-15. T.D. 2,230 ft.; W.O.S.R.
Stanolind O. & G. Co. No. 123 Dillon, NW SE sec. 14-21-15. Loc.
Stanolind O. & G. Co. No. 124 Dillon, NW SE sec. 14-21-15. Loc.
Stanolind No. 1 Wheritt, SE SW sec. 23-21-15. T.D. 1,640 ft.; acidized.
Stewart Williams No. 2 Connell, SW NE sec. 10-20-15. 10-in. 80 ft.
Surf Oil Co. No. 2 Self, SE NE SE sec. 10-20-15. 10-in. cmtd. 90 ft.

Claiborne Parish

Atlantic Ref. Co. et al No. 1 F. B. King, SE sec. 35-21-5. Drlg. 3,515 ft.
J. B. Bond No. 1 H. E. Patton, E½ NW NW sec. 36-21-5. Comp.; flw. 15 B.P.H.; T.D. 5,290 ft.
Gulf Ref. Co. No. 2 Eva Bennett, sec. 31-21-4. Drlg. 4,370 ft.
Gulf No. 1 Henry, S½ NW NE sec. 31-21-4. Drlg. 2,737 ft.
Hollifield & McFarland No. 1 M. Patton, N½ NW SE sec. 31-21-4. Drlg. 3,320 ft.
T. L. James & Co. No. 1 Baker, W½ SE NE sec. 25-21-5. Drk.
La. Lse. & Dev. Co. No. 1 R. D. McDonald, W½ NW NW sec. 25-21-5. R.U.
Love Pet. Co. No. 2 H. E. Patton, W½ SW SE sec. 36-21-5. Drlg. 4,655 ft.
Lyons & Neely No. 2 H. E. Patton, W½ NW SW sec. 36-21-5. Drlg. 4,658 ft.
Lyons & Neely No. 1-B Maggie Patton, W½ SE SW sec. 31-21-4. Drlg. 4,140 ft.
Lyons & Neely No. 2-B Maggie Patton, E½ SE SW sec. 31-21-4. Drlg. 2,250 ft.
Lyons & Neely No. 2 Maggie Patton, E½ NW SW sec. 31-24-4. Drlg. 5,173 ft.
Magnolia Pet. No. 1 English, S½ SE SW sec. 31-21-4. Drlg. 4,640 ft.
Magnolia Pet. Co. No. 2 English, S½ SW NE sec. 31-21-4. R.U.
Magnolia Pet. No. 1 H. E. Patton, NW SE SW sec. 36-21-5. 7-in. 5,323 ft.; T.D. 5,336 ft.
L. O. McMillan No. 1 McDonald, E½ NW NW sec. 31-21-4. Loc.
L. O. McMillan No. 1-B Maggie Patton, sec. 31-21-4. Comp.; flw. 668 B.P.D.; T.D. 5,301 ft.
L. O. McMillan et al No. 2 H. E. Patton, W½ SW NW sec. 36-21-5. Drlg. 4,103 ft.
L. O. McMillan et al No. 2-A H. E. Patton, N½ NE SW sec. 31-21-4. Drlg. 5,294 ft.
McMillian et al No. 2 Roberta Vaughn, N½ NW NE sec. 36-21-5. R.U.
C. R. Schuster No. 1 M. S. Patton, NE NW NE sec. 1-20-5. Drk.
C. R. Schuster et al No. 2 M. S. Patton, S½ NW NE sec. 1-20-5. Drlg. 100 ft.
Scouts Oil Co. No. 1 R. Vaughn, E½ NE NW sec. 36-21-5. Drlg. 2,175 ft.
Scouts Oil Co. No. 2 R. Vaughn, W½ NE NW sec. 36-21-5. M.I.M.
Shreveport Oil Corp. No. 1 Edwards, NE sec. 16-20-5w. Drlg. 2,720 ft.
Standard Oil No. 1 F. B. King, 660 ft. N, 330 ft. W, SE SE NE sec. 35-21-5. Drlg. 3,292 ft.
Sugar Creek Synd. No. 1 Carter Unit, sec. 32-20-5; O.W.D.D. T.D. 5,748 ft.; tstg. 10,000,000 ft. gas.
J. C. Tippett No. 1 H. E. Patton, 330 ft. N and E, SW SE sec. 36-21-5. Comp.; flw. 50 B.P.H.; T.D. 5,318 ft.
J. C. Tippett No. 2 H. E. Patton, sec. 36-21-5. 10-in. cmtd. 700 ft.; W.O.C.S.
P. W. Woodruff No. 1-B McDonald, N½ SE NE sec. 36-21-5. Drlg. 5,150 ft.
P. W. Woodruff No. 2-B McDonald, N½ NE NE sec. 36-21-5. Loc.
P. W. Woodruff No. 1 T. E. Patton, S½ SE NE sec. 36-21-5. Drlg. 5,100 ft.

De Soto Parish

Chamberlin et al No. 1 Lainer, SW NE sec. 29-11-11. T.D. 2,900 ft.; rg. to bttm.
Grogan Oil No. 1-A Ramsey, sec. 36-11-11. Drk.
Rio Rajo Oil Co. No. 7 Prudhomme, SE cor. sec. 20-12-11. T.D. 2,749 ft.; W.O. S.R.
Superior Oil Co. of Okla. No. 1 Joyner, SE NW SW sec. 28-11-12. T.D. 3,300 ft.; R.U. to D.D.

Franklin Parish

Jensen & Bailey No. 1 Grayson, C NE sec. 36-12-6e. Drlg. 1,250 ft.

Grant Parish

Burkett et al No. 1 Morrison, 156 ft. E and W, NW SW SW sec. 10-9-1e. T.D. 1,525 ft.; will set csg.
R. W. Fair No. 1 R. L. Gray, NW cor. 180-ac. tr. T.D. 2,040 ft.; S.D. for wtr.
H. M. S. Corp. No. 1 McNeely, sec. 21-6n-3w. 20-in. csg. 20 ft.
Harvey Weir No. 1 Calfax Bk. & Tr. Co., NE NW sec. 15-7n-3w. 10-in. cmtd. 160 ft.; W.O.C.S.

LaSalle Parish

Montgomery No. 1 Tullos, SW SE sec. 23-10-1e. Drk.

Lincoln Parish

J. D. Carruthers No. 1 Aycock, N½ SW SW sec. 6-20-4. R.U.
B. O. D. C. and H. D. Easton No. 1 G. W. Dye, NE NE sec. 21-19-4w. Drlg. 50 ft.
Glassell & Glassell No. 1 Gray, SE sec. 16-20-3e. Drlg. 4,430 ft.
Lyons & Neely No. 1 W. H. Patton, N¼ NW NW sec. 6-20-4. Comp.; flw. 24 B. P.H.; T.D. 5,342 ft.
E. T. Oakes-H. D. Easton and Evans No. 1 R. L. Sanderson, NW SE NW sec. 36-18-1w. Drk.

Morehouse Parish

J. E. Ferrell No. 1, NE sec. 27-20-4e. Loc.

Ouachita Parish

J & H Oil Co. No. 2-A Frost Lbr. Co., SW NW sec. 36-19-3e. 12-in. cmtd. 180 ft.

Red River Parish

F. G. Gellz No. 1 Teekell, SW SE sec. 34-13-10. T.D. 1,027 ft.; D.&A.
Gulf No. 27 Kennedy, SW sec. 24-13-11. Comp.; pmp. 63 B.P.D.; T.D. 2,553 ft.
Gulf Prod. Co. No. 41 E. T. Robinson, NW sec. 25-13-11. 6-in. cmtd. 2,490 ft.; W. O.C.S.
Perla Oil Co. No. 1 DeLong, 330 ft. S and E, C sec. 23-12-10. 7-in. cmtd. 1,023 ft.; S.O.; T.D. 1,039 ft.
J. D. Wadley No. 1 McClelland, SE NE sec. 24-13-11. 7-in. cmtd. 2,520 ft.; W. O.C.S.

Sabine Parish

Odell Henson No. 11 Long Bell, SE NE NW sec. 5-8-13. S.D. 40 ft.
Kirk-Green-Way Inc. No. 1 Whitney Corp., NW NE sec. 8-9-13. T.D. 5,707 ft.; D.S. showed mud and S.W.
Perla Oil Co. No. 1 Brown, SE SW NW sec. 16-9-13. Drlg. 1,121 ft.
Producers O. & G. Co. No. 5 Edwards Est., SW NW SW sec. 29-9-13. Comp.; pmp. 75 B.P.D.; T.D. 1,739 ft.
Prod. O. & G. Co. No. 1 Lynch, SW NE SW sec 29-9-13. Pumped off; acid; T.D. 1,608 ft.
Ray Drlg. Co. No. 3 Burkett, NW SW sec. 10-9-13. Comp.; pmp. 55 B.P.D.; T.D. 1,525 ft.
A. C. Scott No. 1 Bowman-Hicks Lbr. Co., sec. 23-9-13. T.D. 3,098 ft.; tstg.
Willis & Dowden No. 1 Lynch, SW NE SW sec. 29-9-13. T.D. 1,608 ft.; arg. tst.
Windsor No. 1 H. Brown, NW SW NW sec. 16-9-13. R.U.
Windsor Oil Co. No. 1 S. Brown, SW NW NW sec. 16-9-13. 10-in. 61 ft.
Windsor No. 1 M. Elliott, SE NE NW sec. 17-9-13. R.U.

Tensas Parish

H. M. Jones et al No. 1 Chicago Mill & Lbr. Co., NE sec. 30-12n-10e. T.D. 798 ft.; blew out after stng. 8 mo.; gauging 30,000,000 ft. gas and 10,000 bbls. wtr.; drld. out bridge and well blew out again and bridged over: T.D. 798 ft W.O.; T.D. 798 ft.; blew out again and bridged.

Union Parish

Interstate Fee No. 64, NW sec. 29-21-4e. 8-in. cmtd. 760 ft.
Interstate Gas Co. No. 68 fee, SW sec. 29-21-4e. R.U.
Interstate Gas Co. No. 69 fee, SE sec. 30-21-4e. 6-in. cmtd. 2,096 ft.

Webster Parish

W. H. Bass Drlg. Co. No. 1 T. Crichton, C NW NW sec. 21-20-9. T.D. 6,420 ft.; D.&A.
N. V. Duncan No. 1 G. T. Baker, sec. 9-23-9. T.D. 3,250 ft.; D.&A.
Magnolia No. 2 D. G. Cox, SW SE NE sec. 22-21-10. Drlg. 6,628 ft.
Magnolia Pet. Co. No. 2 G. W. Cole, NE NW NE sec. 27-21-10. Drlg. 3,580 ft.
Magnolia Pet. No. 6 Ira Cox, NE NE SE sec. 23-21-10. Drlg. 4,141 ft.
Magnolia Pet. Co. No. 2 A. J. McCook, SW sec. 22-21-10. Drk.
Ohio Oil Co. No. 1 S. P. D. Coyle, NW SE SW sec. 23-21-10. Drlg. 8,022 ft.
Ohio Oil Co. No 2 R. M. Coyle, SE sec. 22-21-10. Drlg. 7,492 ft.
Ohio No. 1 S. P. D. Coyle and W. Cox, SW SW SE sec. 23-21-10. Drk.
Ohio Oil No. 1 T. Crichton, Acct. No. 2, SE NE sec. 21-21-10. Drk.
Ohio Oil No. 1 L. M. Gardner, NE sec. 22-21-10. Drlg. 6,570 ft.
Ohio Oil Co. No. 2 A. H. Gray Acct. No. 2, NW sec. 26-21-10. Drlg. 8,341 ft.
Ohio Oil Co. No. 2 A. J. Hodges, NE NW SW sec. 23-21-10. Drlg. 8,502 ft.
Ohio No. 7-B R. L. Holloway, 586 ft. N, 758 ft. E line, sec. 23-21-10. Drk.
L. R. Skidmore No. 1 Barnett, NE NW SW sec. 29-17-9. T.D. 3,785 ft.; S.D.
Standard Oil of La. No. 1 E. L. Stewart, SE SE SE sec. 32-21-10. Drlg. 5,840 ft.
Woodley Pet. Co. No. 4-B Gray, NE NE sec. 27-21-10. T.D. 8,444 ft.; trying to free stuck drill pipe.

SOUTH LOUISIANA FIELDS

Abbeville—Vermilion Parish

Continental Oil Co. No. 1 Brookshire, sec. 66-12s-3e. Drk.

Bayou Blue—Iberville Parish

Humble O. & R. Co. No. 3 Wilbert sec. 74-9s-10e. Drk.

Bay St. Elaine—Terrebonne Parish

F. J. LeBlanc et al No. 1 Wurzlow, sec. 17-22s-18e. Drlg. wtr. sd. 300 ft.
Texas Co. No. 14 State, sec. 20-22s-18e. Drlg. sdy. L. 4,821 ft.

Bayou Cocotrix—Terrebonne Parish

Shell Pet. Corp. No. 1 Pelican, sec. 35-17s-15e. Cg. sdy. sh. 9,702 ft.
Shell Pet. Corp. No. 2-B Realty Operators, sec. 18-17s-15e. R.U.

Big Lake—Cameron Parish

Union Sulphur Co. and Shell Pet. Corp. No. 1 Henry Hebert, sec. 18-12s-8w. Spd.

Black Bayou—Cameron Parish

Shell Pet. Corp. No. 37 Watkins, sec. 8-12s-12w. T.D. 4,648 ft.; salt; P.B. 3,588 ft.; sdtrkd.; drlg. sd. 4,427 ft.

Caillou Island—Terrebonne Parish

Texas Co. No. 1 L.L.&E., sec. 18-23s-20e. Drk.
Texas Co. No. 41 State, sec. 17-23s-20e. T.D. 4,644 ft.; 7-in. csg. 4,590 ft.

Charenton—St. Mary Parish

Pan American Prod. Co. No. 3 Laws Realty Co., sec. 25-12s-9e. T.D. 8,853 ft.; run Schlumberger.
Pan American Ref. Co. No. 4 Laws Realty Co., sec. 30-13s-10e. Drk.
Pan American Prod. Co. No. 1 South Coast Corp., sec. 30-13s-10e. T.D. 7,923 ft.; rec. 1,000 ft. of P.L.O. on D.S.T. 7,906-23 ft.; 7-in. csg. 7,906 ft.; flwd. est. 600 bbls. of fluid per day 50% S.W.; will W.O.
Pan American Prod. Co. No. 1 Veeder, sec. 30-13s-10e. Drk.

Cameron Meadows—Cameron Parish

Burton-Sutton Oil Co. No. 16 Sch. Ld., sec. 16-14s-13w. Drk.
Magnolia Pet. Co. No. 19 Cameron Meadows, sec. 16-14s-13w. S.D. 5,834 ft.

Darrow—Ascension Parish

Humble O. & R. Co. No. 1 V. E. Landry, sec. 34-10s-2e. Drlg. 6,712 ft.
Kira Oil Co. No. 1 Duplessis, sec. 69-10s-2w. R.U.

Dog Lake—Terrebonne Parish

Texas Co. No. 5 State, sec. 5-22s-16e. 10¾-in. csg. 1,505 ft.; T.D. 6,885 ft.; P.B. and sdtrkd.; drlg. sh. 6,720 ft.

Fausse Point—Iberia Parish

Texas Co. No. 3 State, sec. 35-11s-8e. Drlg. sd. 498 ft.

Garden Island—Plaquemines Parish

Texas Co. No. 21 State, sec. 37-23s-33e T.D. 5,059 f.t; run Schlumberger sur.

Gillis—Calcasieu Parish

Fohs Oil Co. No. 18 Castle, sec. 34-10s-12w. Drlg. sdy. sh. 3,183 ft.
Union Sulphur Co. No. 14 Barbe, sec. 1-9s-8w. T.D. 6,738 ft.; 7-in. csg. 6,723 ft.; S.D.
Union Sulphur Co. No. 15 Barbe, sec. 1-9s-8w. T.D. 6,730 ft.; P.B. 3,930 ft.; drlg. sh. 4,260 ft.
Union Sulphur Co. No. 7 Castle, sec. 14-9s-8w. T.D. 7,123 ft.; run csg.
Union Sulphur Co. No. 5 Kaufman, sec. 13-7s-8w. Drlg. sh. 3,361 ft.
Union Sulphur Co. No. 6 Mayo-Reeves, sec. 12-9s-8w. Drlg. sh. and L. 5,233 ft.

Hackberry—Cameron Parish

Burton-Sutton Joint Interest No. 2-A Duhon, sec. 22-12s-10w. R.U.
W. T. Burton No. 2 Ray Lewis, sec. 22-12s-10w. Drk.
W. T. Burton No. 2 R. Vincent, sec. 22-12s-10w. Drlg. sh. 2,730 ft.
Emanon Oil Co. No. 1 Porter Ellender, sec. 21-12s-10w. Drlg. sdy. sh. 2,612 ft.
Stanolind O. & G. Co. No. 7 Carter Sweeney, sec. 22-12s-10w. R.U.
Stanolind O. & G. Co. No. 8 Carter Sweeney, sec. 22-12s-10w. R.U.
Stanolind O. & G. Co. No. 1-B Duhon, sec. 27-12s-10w. Drlg. sh. 3,302 ft.
Stanolind O. & G. Co. No. 4 Duhon, sec. 22-12s-10w. Drk.
Stanolind O. & G. Co. No. 25-B Gulf Land fee, sec. 15-12s-10w. 20-in. csg. 158 ft.; drlg. sh. 6,812 ft.
Stanolind O. & G. Co. No. 4 Lacey, sec. 27-12s-10w. Bldg. drk.
Stanolind O. & G. Co. No. 1 Little, sec. 28-12s-10w. Run 109 ft. 16-in. csg.; drlg sh. 4,730 ft.
Stanolind O. & G. Co. No. 19 School Ld., sec. 16-12s-10w. R.U.
Stanolind O. & G. Co. No. 53 State, sec. 16-12s-10w. Drk.
Texas Co. No. 22-B State, Twp. 12s-9w. Drk.
Union Sulphur Co. No. 9 Doiron, sec. 37-12s-10w. Drlg. 824 ft.

Iowa—Jefferson Davis Parish

Shell Pet. Corp. No. 24 Heyd, sec. 13-9s-7w. Drlg. sd. 4,287 ft.

Jeanerette—St. Mary Parish

Herton Oil Co. No. 1 Banta, sec. 40-13s-9e. 9⅝-in. csg. 7,030 ft.; drlg. sh. 8,512 ft.
Herton Oil Co. No. 7 Carter, sec. 38-13s-9e. R.U.
Herton Oil Co. No. 2 Roanes, sec. 40-13s-9e. R.U.

Jennings—Acadia Parish

Frank W. Bennett et al No. 1 Brethern and Christ Church, sec. 41-7s-2w. Loc.
W. T. Burton No. 1 Robira, sec. 41-9s-2w. T.D. 6,904 ft.; P.B. 6,828 ft.; 7-in. csg. 6,904 ft.
Alfred Glassell No. 1 R. McFarlan, sec. 41-9s-2w. Drlg. sd. 5,002 ft.
Alfred Glassell No. 1 Troushelle, sec. 42-9s-2w. Drlg. sh. 6,372 ft.
Stanolind O. & G. Co. No. 18 Houssiere-Latrielle, sec. 47-9s-2w. 8⅝-in. csg. 5,358 ft.; T.D. 7,072 ft.; 6⅝-in. csg. 7,005 ft.; making 2½ bbls. of distillate per day; killed to W.O.; cg. ahead.
Superior Oil Prod. Co. No. 2 Iowa-Jennings, sec. 41. Drlg. sdy. sh. 4,544 ft.
Superior Oil Prod. Co. No. 3 Jennings, sec. 42-9s-2w. Drlg. sdy. sh. 6,051 ft.
Superior Oil Prod. Co. No. 3 Wm. Lecklet T.D. 6,731 ft.; run 7-in. csg.
Superior Oil Prod. Co. No. 4 Lecklet, sec. 42-9s-2w. Drlg. sh. 5,535 ft.
Superior Oil Co. No. 5 W. M. Lecklet, sec. 42-9s-2w. Drk.

Lafitte—Jefferson Parish

Texas Co. No. 2 Milling, sec. 20-17s-24e. Dredging canal.
Texas Co. No. 7 Rigolet, sec. 29-17s-24e. T.D. 9,368 ft.; oil sd.; cg. ahead.
Texas Co. No. 1 State-Bayou Norman, sec. 28-17s-24e. Drlg. sdy. sh. 9,412 ft.

Lake Pelto—Terrebonne Parish

Texas Co. No. 15 State, sec. 17-23s-18e. T.D. 7,136 ft.; 7⅝-in. csg. 6,160 ft.; I.P. 804 B.P.D.; ⅝-in. ck.

Lake Hermitage—Plaquemines Parish

Gulf Ref. Co. No. 7 Lafourche, sec. 12-18s-25e. R.U.

Leesville—Lafourche Parish

Gulf Ref. Co. No. 2 Allen Land Co., sec. 26-21s-22e. T.D. 1,048 ft.; P.B. 683 ft.
Gulf Ref. Co No. 64 Leesville, sec. 26-21s-10s-9w. T.D. 4,433 ft.; 7⅝-in. csg. 4,374 ft.
Texas Co. No. 65 Leesville, sec. 27-21s-22e. Drlg. sdy. sh. 3,456 ft.

Lockport—Cameron Parish

Magnolia Pet. Co. No. 6 Freeburg, sec. 9-10s-9w. T.D. 6,485 ft.

New Iberia—Iberia Parish

Wm. Hellis No. 8 Bernard, sec. 54-12s-7e. Sh. and L. 4,909 ft.; no report.
Wm. Hellis No. 3 Schwing, sec. 57-12s-7e. S.D. 4,962 ft.; salt; P.B. and sdtrkd.; drlg. sh. 3,312 ft.
Texas Co. No. 3 Bryant, sec. 25-12s-7e. Spd.
Wm. Hellis No. 5 Bullock-Burke, sec. 52-12s-7e. Drlg. 2,012 ft.
Texas Co. No. 3 Duhe, sec. 26-12s-7e. Drk.
Texas Co. No. 6-B Hanzen, sec. 54-12s-7e. Spudded.

Port Barre—St. Landry Parish

Pan American Prod. Co. No. 2 Watkins, sec. 4-6s-5e. Straightening hole 5,300 ft.

Roanoke—Jefferson Davis Parish

Humble O. & R. Co. No. 6 Kratzer, sec 11-9s-4w. Drlg. sdy. L. 8,143 ft.

Sorrento—Ascension Parish

Sorrento Oil Co. No. 1 Bernard, sec. 9-19s-14e. T.D. 6,708 ft.; P.B. 5,373 ft.; drlg. sh. 6,156 ft.

South Roanoke—Jeff Davis Parish

Union Sulphur Co. et al No. 1 T.R.S. Farms Co., sec. 23-10s-4w. Spd.

South Jennings—Jeff Davis Parish

Stanolind-Amerada Pet. Corp. No. 2 Calcasieu Natl. Bank, sec. 10-10s-3w. 13⅜-in. csg. 1,987 ft.; drlg. sdy. sh. 7,824 ft.

Starks—Calcasieu Parish

J. R. Turnbull No. 1 Industrial Lbr. Co. sec. 20-9s-12w. S.D. 6,433 ft.

St. Martinsville—St. Martin Parish

Tide Water Oil Co. No. 1-C Smedes, sec. 57-11s-6e. Drlg. sh. and L. 8,034 ft.
Tide Water Oil Co. No. 4 Smedes, sec. 57-11s-6e. R.U.

Tepetate—Acadia Parish

Continental Oil Co. No. 1 Guilery, sec. 34-7s-2w. R.U.
Continental Oil Co. No. 2 Macabees, sec. 22-7s-2w. Drk.
Continental Oil Co. No. 1 Vincent and Welch, sec. 30-7s-2w. Drlg. sh. 7,312 ft.
Continental Oil Co. No. 8-A Welch, sec. 28-7s-2w. T.D. 8,306 ft.; 5¾-in. csg. 8,306 ft.; comp.; no gauge.

Valentine—Lafourche Parish

Pan American Prod. Co. No. 3 Harang, sec. 8-17s-20e. T.D. 7,718 ft.; D.P. stuck. P.B. 5,154 ft.; drlg. 6,815 ft.
Pan American Prod. Co. No. 5 Harang, sec. 8-17s-20e. 16-in. csg. 235 ft.; drlg. sh. 6,912 ft.
Pan American Prod. Co. No. 6 Harang, sec. 8-17s-20e. Drk.

White Castle—Calcasieu Parish

Shell Pet. Corp. No. 4 Shingle, sec. 12-11s-12e. T.D. 8,903 ft.; P.B. 8,717 ft.; milling out of csg. at 8,027 ft.; drlg. sdy. sh. 8,632 ft.

S. LOUISIANA WILDCATS

Acadia Parish

H. E. Dalton No. 1 Setting, sec. 17-7s-1w. T.D. 5,426 ft.; left 900 ft. of D.S. in hole.
Humble O. & R. Co. No. 1 Floyd Williams, sec. 34-8s-1e. Drlg. sh. 7,708 ft.
J. G. Mayo et al. No. 1 Bank of Commerce, sec. 19-7s-1e. M.I.M.

Allen Parish

Humble O. & R. Co. No. 3 Bel, located in cratered hole, sec. 26-6s-7w. 10¾-in. csg. 165 ft.; T.D. 2,870 ft.; 7-in. csg. 2,786 ft.; shot well; failed to stop flwg. S.W.; S.D.

Avoyelles Parish

Coastal Minerals No. 1 Purdy-Hess, sec. 25-2n-3e. Drk.; S.D.; high wtr.

Cameron Parish

Humble O. & R. Co. No. 1 Hanzen, sec. 5-12s-6w. 13⅜-in. csg. 3,046 ft.

Pure Oil Co. No. 2 State, sec. 14-13s-3w. Moving in.
Southern Sulphur Co. No. 2 State, sec. 29-15s-10w. S.D. 2,611 ft.

Cameron Parish—Gulf of Mexico

Superior Oil Prod. Co. et al No. 1 State-Gulf of Mexico, 3,800 ft. W, 6,200 ft. S of SE cor. of irregular sec. 4-15s-8w. Loc.

East Baton Rouge Parish

Cavalier Oil Co. No. 1 Elliott, sec. 3-9s-2e. R.U.
Cavalier Oil Co. No. 1 Jacobs, sec. 69-4s-1w. Spdd.

East Feliciana—Wild

Koch et al No. 1 Andrews, sec. 69-2s-3e. Mixing mud; encountered cavity.

Evangeline Parish

Belle Chenney Springs Oil Co. No. 1 Belle Springs Land Dev. Co., sec. 10-2s-1w. Drld. to 2,215 ft.; S.D.

Iberia Parish

E. J. Beaullied No. 1 Ozenine, sec. 9-13s-7e. T.D. 1,597 ft.; rmg.
Jefferson Lake Oil Co. No. 414 State Lake Pigneur, Twp. 12s-5e. Top salt 990 ft., set 10¾-in. csg. 5,095 ft.; top oil sd. 6,915 ft.; 7-in. csg. 6,930 ft.; cd. salt 7,059-60 ft.; P.B. 5,500 ft.; drlg. sh. and L. 6,295 ft.
Texas Co. No. 2-B Vermilion Bay, Twp. 16s-5e. Move in.

Jefferson Parish

Louisiana Crusader Oil Corp. No. 1 Langley, sec. 36-7s-5w. T.D. 7,450 ft.; P.B. to sdtrk. at 6,868 ft.; T.D. 8,043 ft.; rmg.
Triangle Oil Co. No. 1 Conroe, sec. 125-12s-11e. T.D. 2,461 ft.; R.U.

Jefferson Davis Parish

Stanolind O. & G. Co. No. 2-B Calcasieu Natl. Bank, sec. 28-7s-3w. 13⅜-in. csg. 1,950 ft.; drlg. sh. 6,872 ft.

Lafourche Parish

Gulf Oil Corp. No. 3 State, sec. 36-23s-21e. R.U.
Fohs Oil Co. No. 1 State Lake, sec. 65-17s-19e. 9⅝-in. csg. 8,384 ft.; drlg. sh. 8,610 ft.
Wm. Hellis No. 1 City of New Orleans, sec. 19-23s-23e. T.D. 7,607 ft.; 7-in. csg. on bttm.; P.B.; perf. csg. 7,303-33 ft.; tstg.; showed S.W.; perf. csg. 7,270-80 ft.; tstg.

Livingston Parish

Coastline Oil Co. No. 1 Addison Trust Co., sec. 7-7s-3e. Drk.

Plaquemines Parish

Gulf Oil Corp. No. 1 Bay-Adams sec. 32-52s-19. Drlg. sh. 4,637 ft.
Tide Water Oil Co. No. 3 Manhattan Fruit Co., sec. 26-21s-30e. R.U.

Rapides Parish

C. L. Decker No. 1 Lee Lbr. Co., sec. 21-5n-3e. S.D. 1,470 ft.
R. D. Webb No. 1 A. M. Brasher, sec. 22-4n-2w. S.D. 5,236 ft.

St. Bernard Parish

Gulf Oil Corp. No. 1 Lake Lery, sec. 28-14s-14e. Drlg. sd. 6,234 ft.
Southern Sulphur Co. No. 2 State Lake Borgne, sec. 38-14s-15e. 13⅜-in. csg. 303 ft.; S.D. 3,170 ft.

St. Charles Parish

Amerada Pet. Corp. and La. Ld. & Expl. Co. No. 1 State, sec. 13-15s-20e. Drlg. sd. 5,457 ft.

St. Landry Parish

Gulf Oil Corp. No. 1 Haas & Hirsch, sec. 12-6s-7e. R.U.
Shell Pet. Corp. No. 1 Boagni, sec. 48-8s-4e. 10¾-in. csg. 2,521 ft.; abd. 9,006 ft.

St. Martin Parish

Geo. E. Lilly et al No. 1 Martin, sec. 32-9s-7e. Drlg. sdy. sh. 3,890 ft.
Texas Co. No. 3 State, sec. 14-10s-9e. cmtd. on bttm.; T.D. 8,208 ft.; top salt 8,175 ft.; P.B. 7,600 ft.

St. Mary Parish

Texas Co. No. 1 Horse Shoe Bayou, sec. 40-17s-9e. T.D. 10,975 ft.; 7⅝-in. csg. 18-in. csg. 101 ft.; T.D. 12,261 ft.; blew out; caught fire; burned for 1 hr. and hole bridged; moved in drlg. barge.
Texas Co. No. 1 State-Bateman Lake, sec. 21-16s-12e. Drlg. sh. 9,707 ft.

ARKANSAS

Clark County

Carter & Burdick No. 1 Ozan Lbr. Co., NE NE SW sec. 25-9-19. D.&A.; T.D. 1,525 ft.

Cleveland County

Tex-Canadian Dev. Co. No. 1 J. E. Moore, SE NE NE sec. 22-9s-10w. R.U.

Columbia County

Robt. Keene et al No. 1 Rungon, SE NE sec. 1-16s-21w. Drk.

Dallas County

J. C. Kelly No. 1 Serrells, SE SE SW sec. 35-10-16. Drlg. 156 ft.

Hempstead County

H. D. Easton et al No. 1 R. M. Lagrove, C NE NE sec. 5-12-26w. R.U.
E. H. Moore, Inc. No. 1 fee, NE cor. E½ SE¼ sec. 21-14-25. Cg. 3,250 ft.
Shenhard & Todd et al No. 1 Smith, NW SW SE sec. 11-11-25. S.D. 1,736 ft.; high water.

Lincoln County

Fitzwater, Inc., No. 1 B. Owens, NW SW NE sec. 26-9s-8w. M.I.R.

Little River County

Joe Strahan No. 1 Dierks, SW SE sec. 21-12-28. Cla. S.O.; 7-in. 2,300 ft.; T.D. 2,304 ft.

Lonoke County

Frank F. Silvers No. 2 Chambers, SW NE NW sec. 17-2n-7w. S.D. 1,012 ft.

Miller County

E. H. Moore No. 2 Dale, 660 ft. N and W, C sec. 24-15-26. Drlg. 5,354 ft.
Standard Oil Co. No. 1 Sarah Harvey, SW SW SW sec. 33-16s-26w. Loc.

Miller County—Rodessa

McClanahan et al No. 1 W. L. Capps, sec. 11-20-28. Drlg. 5,158 ft.

Nevada County

Benedum & Trees No. 1 Grove, sec. 10-14-20. Drlg. 4,717 ft.
Berry Asphalt Co. No. 2 J. Haynie, NE SE SW sec. 6-14-20. Comp.; pmp. 10 B.P.D.; T.D. 1,166 ft.
Berry Asphalt Co. No. 3 W. Haynie, SE NE SW sec. 6-14-20. T.D. 1,166 ft.; W. O.S.R.
Shepard, Traylor & Jones No. 1 Purifey, NE NE sec. 17-11-20. S.D. 583 ft.

Ouachita County

Copenhaver Oil Corp. No. 1 J. E. Evans, C sec. 20-11-19. R.U.
H. H. Taylor No. 1 Joe McCree, NW SW NW sec. 21-13-19. Drlg. 2,700 ft.

Paluski County

A. L. Kilselman No. 2 Kilselman, Jr., SE SE SW sec. 2-1s-13e. S.D. 844 ft.

Union County

Alice-Sydney Oil Co. No. 1 Morgan, NW NE SE sec. 18-18-17. Cg. 5,530 ft.
Lion Oil No. 2-B Edna Morgan, SW NW SE sec. 18-18-17. Cg. 5,587 ft.; oil on D.S.
Marine Oil Co. No. 1 Marcus Justiss, NW¼ sec. 18-18-17. T.D. 5,660 ft.; flow 940 bbls. in 13 hrs.; comp.
Marine Oil Co. No. 6-E W. B. Thompson, SW NE NE sec. 10-18-13. T.D. 3,585 ft.; W.O.S.R.
W. D. Wingfield et al No. 1 So. Kraft Corp., SW NE sec. 18-16-14. Drlg. 2,506 ft.

TEXAS

Week Ending May 29

GULF COAST FIELDS

Raccoon Bend—Austin County

Humble O. & R. Co. No. 11-G Wilson, Wm. Harvey Sur. Drlg. sh. 4,255 ft.

Hastings—Brazoria County

Goldson and Humble O. & R. Co. No. 3 Roos, Sarah McKissick Sur. T.D. 6,108 ft.; I.P. 670 B.P.D.; ¼-in. ck.
W. L. Goldston et al No. 2 Thomas-Ross, S. McKissick Sur. T.D. 6,108 ft.; 7-in. csg. 6,088 ft.
W. L. Goldston et al No. 2 Thomas Ross, Lot 1, tract f., S. McKissick Sur. 9⅝-in. csg. 1,294 ft.
Humble O. & R. Co. No. 4-B Brown, Perry & Austin Sur. T.D. 6,080 ft.; 5½-in. csg. 5,983 ft.; I.P. 649 B.P.D.
Humble O. & R. Co. No. 1 Hawley, B.B. B.&C. Sur. T.D. 6,114 ft.; I.P. 477 B.P.D.; ¼-in. ck.
Humble O. & R. Co. No. 2 R. D. Haden, R. Hoppel Sur. 9⅝-in. csg. 1,292 ft.
Humble O. & R. Co. No. 1 Knack, Perry & Austin Sur. R.U.
Humble O. & R. Co. No. 1 Cecil O'Connor, H.T.&B. Sur. No. 29. T.D. 6,080 ft.; I.P. 634 B.P.D.; ¼-in. ck.
Navarro Oil Co. No. 1-A W. F. Beers, Perry & Austin Sur. T.D. 6,065 ft.; 7-in. csg. 5,995 ft.
Navarro Oil Co. No. 2-A W. F. Beers, Perry & Austin Sur. Drk.
Navarro Oil Co. No. 2-B W. F. Beers, Perry & Austin Sur. T.D. 6,082 ft.; 7-in. csg. 6,056 ft.
Stanolind O. & G. Co. No. 3 R. L. Autrey, H.T.&B. Sur. No. 37. Drk.
Stanolind O. & G. Co. No. 4 Floyd Brown, H.T.&B. Sur. No. 29. 10¾-in. csg. 1,662 ft.; T.D. 5,925 ft.; 7-in. csg. 5,682 ft. I.P. 618 B.P.D.; ¼-in. ck.
Stanolind O. & G. Co. No. 1 J. F. Butts, H.&T.B. Sur. T.D. 6,100 ft.; 7-in. csg. 6,017 ft.
Stanolind O. & G. Co. No. 1 Mary Condon, H.T.&B. Sur. No. 29. 16-in. csg. 90 ft.; T.D. 6,080 ft.; run csg.
Stanolind O. & G. Co. No. 5 Curkett, H.T. &B. Sur. No. 30. T.D. 1,680 ft.; W.O.C.
Stanolind O. & G. Co. No. 3 T. C. Edwards, Wm. Henry Sur. R.U.
Stanolind O. & G. Co. No. 2 J. M. Elliott, Wm. Henry Sur. T.D. 6,075 ft.; 5¾-in. csg. 6,053 ft.
Stanolind O. & G. Co. No. 11-B H. H. Ford, H.T.&B. Sur. No. 29. T.D. 6,080 ft.; 7-in. csg. 5,624 ft.; I.P. 611 B.P.D.; ¼-in. ck.
Stanolind O. & G. Co. No. 5 Grote, A.C. H.&B. Sur. Drk.
Stanolind O. & G. Co. No. 3 J. C. Hutchins, H.T.&B. Sur. No. 36. T.D. 1,658 ft.; W.O.C.
Stanolind O. & G. Co. No. 4 Law, H.T.&B. Sur. No. 36. Drk.
Stanolind O. & G. Co. No. 2 A. C. McKibben, H.T.&B. Sur. No. 29. T.D. 6,080 ft. 7-in. csg.; flowed 79 bbls. in 19 hrs. I.P. 607 B.P.D.; ¼-in. ck.
Stanolind O. & G. Co. No. 3 L. F. McKibben, H.T.&B. Sur. No. 29. R.U.
Stanolind O. & G. Co. No. 1 Massey, H. T.&B. Sur. No. 29. Drlg. sh. 3,662 ft.
Stanolind O. & G. Co. No. 2 Moore and Rassmussen, A.C.H.&B. Sur. Drk.
Stanolind O. & G. Co. No. 5 Steve Paul, A.C.H.&B. Sur. T.D. 6,080 ft.; 7-in. csg. 5,920 ft.
Stanolind O. & G. Co. No. 6 Steve Paul, A.C.H.&B. Sur. No. 2. Drk.
Stanolind O. & G. Co. No. 7 Steve Paul, A.C.H.&B. Sur. No. 2. Drlg. sd. 5,460 ft.
Stanolind O. & G. Co. No. 4 S. A. Pennock, H.T.&B. Sur. No. 36. T.D. 6,080 ft.; 7-in. csg. 5,893 ft.
Stanolind O. & G. Co. No. 4 Surface, B. B.B.&C. Sur. T.D. 1,640 ft.; W.O.C.
Stanolind O. & G. Co. No. 5 J. W. Surface, A.C.H.&B. Sur. Drlg. sh. 5,337 ft.

Lockridge—Brazoria County

Gulf Oil Corp. No. 2 Gibson, J. W. Hall Sur. Drlg. L. 5,294 ft.
Gulf Oil Corp. No. 2 Fred Reiss, J. W. Hall Sur. Drlg. sh. 3,916 ft.
Gulf Oil Corp. No. 1-A G. L. Wood et al, Thomas Alsberry Sur. No. 4, Abst. No. 2. 13⅜-in. csg. 1,431 ft.; T.D. 6,386 ft.; 9⅝-in. csg. 6,374 ft.; tested S.W. and sd. 6,365-70 ft.; P.B. 6,350 ft.; perf. csg. 6,364-69 ft.; I.P. 297 B.P.D.; ¼-in. ck.
Gulf Oil Corp. No. 4-A Wilkes and Smith, J. W. Hall Sur. Drlg. sh. 510 ft.
Shell Pet. Corp. No. 3 Ramsey State Farm, J. W. Hall Sur. No. 11. 10¾-in. csg. 1,390 ft.; T.D. 6,812 ft.; abd.

Manvel—Brazoria County

Allhands and Davis No. 1 Lambert, E. Little Sur. T.D. 4,067 ft.; I.P. 490 B.P. D.; ¼-in. ck.
T. J. Holcombe No. 1 W. A. Gamble, E. Little Sur. Drlg. sh. 2,300 ft.
E. A. Stone No. 1 Nichols, E. Little Sur. Drk.
Texas Co. No. 16-A W. T. Belcher, H. N. Little Sur. T.D. 5,675 ft.; run 7-in. csg.
Texas Co. No. 25 Houston Oil Field Assn., A.C.H.&B. Sur. No. 91. T.D. 5,696 ft.; 7-in. csg. 5,660 ft.
Texas Co. No. 7 Rash, T. Spraggins Sur. Drlg. sh. and L. 2,813 ft.

Old Ocean—Brazoria County

Harrison & Abercrombie No. 1-A Bernard Land & Dev. Co. O.W.D.D.; drlg sh. 9,597 ft.
Harrison and Abercrombie No. 4 Bernard River Ld. and Development Co., Charles Breen Sur. 13⅜-in. csg. 1,405 ft.; 9⅝-in. csg. 7,005 ft.; sh. 9,877 ft.

Sandy Point—Brazoria County

Bunte O. & G. Co. No. 1 A. A. Sharp, Chester S. Gorbot Sur. T.D. 6,564 ft.; surf. csg. collapsed.; S.D.
Bunte O. & G. Co.-Florence Investment Co. No. 1 Fite. T.D. 6,568 ft.; 5½-in. csg. 6,523 ft.; perf. csg. 6,467-75 ft.; flwg. wet gas; ⅛-in. ck.

Calhoun—Heyser—Victoria County

George Echols No. 4 Bennett, J. Galban Sur. T.D. 5,491 ft.; 7-in. csg. set on bottom; drlg. 5,510 ft.
Humble O. & R. Co. and Plymouth Oil Co. No. 12-A P. H. Welder, A. Sisneros Sur. T.D. 5,485 ft.; swbd. and shut in.
Humble O. & R. Co. and Plymouth Oil Co. No. 13-A P. H. Welder, A. Sisneros Sur. Drlg. sh. 1,021 ft.
Humble Oil and Plymouth Oil Co. No. 14-A P. H. Welder, J. M. Rios Sur. T.D. 5,480 ft.; I.P. 13 B.P.H.; ¼-in. ck.
Humble O. & R. Co. No. 15-A P. H. Welder, J. M. Rios Sur. Drk.
Humble O. & R. Co. No. 16-A P. H. Welder, J. M. Rios Sur. Drlg. sh. 2,922 ft.
Normandile Oil Co. No. 1 J. G. Cook, A. Sisneros Sur. R.U.
Portilla Drlg. Co. No. 7-C P. H. Welder, J. M. Rios Sur. Drk.
Portilla Drlg. Co. No. 8 P. H. Welder, D. D. Palmer Sur. Abd. 5,512 ft.

Anahuac—Chambers County

Gulf Oil Corp. No. 9 Knowles, W. T. Knowles Sur., H.&T.C. Sur. No. 48. T.D. 7,120 ft.; 7-in. csg. 7,108 ft.; tstg.
Gulf Oil Corp. No. 2 Pommer, sec. 40, H &T.C. Sur. R.U.
Humble O. & R. Co. No. 2 H. O. Acom H.T.&B. Sur. No. 23. Drk.
Humble O. & R. Co. No. 12 Broussard H.&T.C. Sur. No. 59. Drlg. sh. 3,139 ft.
Humble O. & R. Co. No. 11 Clark, sec. 57. Drlg. sh. 1,020 ft.
Humble O. & R. Co. No. 2 Drought, sec. 46, H.&T.C. Sur. Drlg. L. 900 ft.
Humble O. & R. Co. No. 12 Gripon, H.& T.C. Sur. No. 51. T.D. 7,080 ft.; I.P. 312 B.P.D.; ¼-in. ck.
Humble O. & R. Co. No. 8 C. Johnson sec. 48, H.&T.C. Sur. T.D. 7,097 ft.; I.P. 288 B.P.D.; ¼-in. ck.
Humble O. & R. Co. No. 9 Johnson, sec. 50, H.&T.C. Sur. Drk.
Humble O. & R. Co. No. 3 Lord, H.&T.C. Sur., sec. 50. Drk.
Humble O. & R. Co. No. 7-B White, J. McGahey Sur. Sh. 6,288 ft.
Humble O. & R. Co. No. 13-B White, J. McGahey Sur. T.D. 7,133 ft.; I.P. 256 B. P.D.; ¼-in. ck.
Humble O. & R. Co. No. 5 Wilcox, sec. 50, H.&T.C. Sur. T.D. 7,080 ft.; W.O.C.

Cotton Lake—Chambers County

Salt Dome Oil Co. No. 2-C Lawrence, S. Barrow Sur. 10¾-in. csg. 1,104 ft.; split sur. csg.; skidded drk. for new hole; drlg. sh. and L. 6,137 ft.

Seabreeze—Chambers County

Sun Oil Co. No. 2 H. O. Acom, H.T.&B. Sur. No. 23. 18⅝-in. csg. 91 ft.; drlg. sh. and L. 6,333 ft.
Sun Oil Co. No. 1-A Broussard-Hebert, T. &N.O. Sur. No. 127. 13⅜-in. csg. 1,366 ft.; T.D. 8,781 ft.; cemented 7-in. csg. 8,380 ft.; P.B. 8,450 ft.; run screen and lnr.

Turtle Bay—Chambers County

Stanolind O. & G. Co. No. 1 Earl R. Davis, Chadrick Burney Sur. Moving in rig.

Big Creek—Fort Bend County

Barnett Pet. Corp. No. 2 J. H. P. Davis B. Nickson Sur. T.D. 3,080 ft.; P.B. and sdtrkd.; drlg. sh. 2,331 ft.
Gulf Oil Corp. No. 75 T. W. Davis, M. Young Sur. T.D. 3,135 ft.; to make D. S.T.
Gulf Oil Corp. No. 76 Davis, M. Young Sur. Drk.

Blue Ridge—Fort Bend County

Telshaw-Reese and Echelson No. 1 Blakely, E. Drew Sur. R.U.

Boling—Fort Bend County

John Deering No. 1 J. M. Moore, Charles Bettner Sur. T.D. 5,268 ft.; P.B. and S.T.; T.D. 5,013 ft.
Mack Hank Oil Co. No. 5-C E. C. Farmer, J. Scott Sur. Drlg. sh. 4,340 ft.

Thompson—Fort Bend County

H. M. Naylor No. 11 S. P. Gehr, S. Kennedy Sur. Drlg. sh. 3,200 ft.
H. M. Naylor No. 11 Gehr, S. Kennedy Sur. T.D. 5,398 ft.; 7-in. csg. 5,280 ft.; R.U. to pmp.

Orchard—Fort Bend County

Gulf Oil Corp. No. 52 Moore, James Frazier Sur. Drlg. sd. and sh. 3,393 ft.
Gulf Oil Corp. No. 53 Moore, J. Frazier Sur. Drlg. sh. and L. 2,320 ft.

High Island—Galveston County

Stanolind O. & G. Co. No. 1-B Cade, B. Denman Sur. T.D. 7,114 ft.; sdy. sh. S.G.
Stanolind O. & G. Co. No. 61 Cade, N. Fitzsimmons Sur. Drlg. sd. 5,365 ft.
Stanolind O. & G. Co. No. 62-A Cade, M. Fitzsimmons Sur. Drlg. sh. and L. 3,435 ft.
Stanolind O. & G. Co. No. 1 C. E. Smith, M. Dunman Sur. M.I.
Stanolind O. & G. Co. No. 15-A Smith, M. Dunman Sur. Drlg. sh. and L. 4,373 ft.

Dickinson—Galveston County

Atlantic O. & R. Co. No. 2 Sealy Hutchins, P. G. Merritt Sur. T.D. 8,127 ft.; 7-in. csg. on bttm.
Diadem Oil Corp. of Texas No. 2 W. J. Way, E. P. Epperson Sur. T.D. 8,198 ft.; 6⅝-in. csg. 8,191 ft.; perf. csg. 8,058-62 ft.; tstd. S.W.; cmtd. perf. csg.; made squeeze job; perf. csg. 8,133-44 ft. R.U. to drill ahead; perf. csg. 8,142-35 ft.; tstd. S.W.; S.D.
Humble O. & R. Co. No. 1 Kilgore, W. K. Wilson Sur. Drk.
Humble O. & R. Co. No. 15-A Maco Stewart, W. K. Wilson Sur. Drk.
Humble O. & R. Co. No. 19-A Maco Stewart, W. K. Wilson Sur. Drlg. sh. 8,747 ft.
Humble O. & R. Co. No. 1 F. W. Mawley, W. K. Wilson Sur. Bldg. drk.
Humble O. & R. Co. No. 8-B M. Stewart, W. Wilson Sur. Drlg. sd. 8,209 ft.
Kenben Oil Co. No. 4 Maco Stewart, W. K. Wilson Sur. T.D. 8,749 ft.; 6⅝-in. csg. 8,647 ft.

LEGAL

Department of the Interior, U. S. Land Office, Las Cruces, New Mexico. Notice is hereby given that the W½ NW¼ Sec. 17, and the E½ NE¼ Sec. 18, T. 17S., R. 31E, N. M. P. M., containing 160 acres, if the Jackson producing oil and gas field, are offered in a single unit to the qualified bidder of the highest amount offered per acre, the minimum bid being $25 per acre, as a bonus for the privilege of leasing the land under section 17 of the mineral leasing act of August 21, 1935 (49 Stat. 674), at the sliding royalty rate scale in the standard lease form on page 6 of Circular 1386, at the sale to be held in the United States Land Office at Las Cruces, New Mexico, at 10 o'clock A. M., on June 25, 1937. The successful bidder must deposit on the date of the sale with the officer in charge of the sale, a certified check on a solvent bank or cash, for one-fifth of the amount bid by him, and file the showing of qualifications to receive a lease required by section 7 of said Circular 1386. Bidders are warned against violations of the provisions of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids at the discretion of the Secretary of the Interior. Register.

W. E. McKinney et al No. 3-A Galveston Houston Elec. R.R., W. K. Wilson Sur T.D. 8,510 ft.; P.B. to sdtrk.; sdtrkd. at 8,300 ft.; P.B. to 7,500 ft.; W.O.C.
Pan American Prod. Co. No. 3 Craig, W. K. Wilson Sur. Drlg. sh. 3,400 ft.
Pure Oil Co. No. 1-B Sealy Hutchins, P. G. Merritt Sur. T.D. 8,146 ft.; 5½-in. csg. on bttm.; perf. csg. 8,132-43 ft.; comp. for dist. producer.
Stanolind O. & G. Co. No. 2 Dameant, W. K. Wilson Sur. Drlg. sdy. sh. 8,800 ft.
Stanolind O. & G. Co. No. 7 State. 13⅜-in. csg. 2,013 ft.; drlg. sh. 5,847 ft.
Turman Oil Co. and Maco Stewart No. 1 Stewart, W. K. Wilson Sur. T.D. 8,931 ft.; P.B. and sdtrkd.; drlg. sh. 8,543 ft.
Turman Oil Co.-Maco Stewart No. 2 Stewart, W. K. Wilson Sur. Drk.

Greens Lake—Galveston County

Sun Oil Co. No. 8 Hughes, W. C. M. Baker Sur. 7-in. csg. 3,890 ft.; T.D. 6,220 ft.; T.A.

Batson—Hardin County

Bunte O. & G. Co. No. 1 Melhome, J. Melhome Sur. T.D. 3,493 ft.; W.O. csg.

Silsbee—Hardin County

Humble O. & R. Co. No. 1 Kirby, G. W. Brooks Sur. Bldg. drk.
Republic Prod. Co.-Houston Oil Co. No. 11 Brooks, G. W. Brooks Sur. 10¾-in. csg. 1,441 ft.; T.D. 6,964 ft.; P.B. 5,683 ft.; drld. into old hole; P.B. 5,400 ft.; T.D. 6,959 ft.; 7-in. csg. 6,953 ft.
Republic Prod. Co-Houston Oil Co. No. 14 Brooks, G. W. Brooks Sur. Drlg. sh. 6,880 ft.
Republic Prod. Co.-Houston Oil Co. No. 15 Brooks. T.D. 6,965 ft.; 7-in. csg. 6,957 ft.; tstg.
Republic Prod.-Houston Oil Co. No. 16 Brooks, G. W. Brooks Sur. Drk.

Bammel—Harris County

Geo. Lawrence No. 2 Zapp, J. Farwell Sur. R.U.

Clinton—Harris County

Stanolind O. & G. Co. No. 1 D. A. Oates, C. Martinez Sur., Abst. 543. 9⅝-in. csg. 6,771 ft.; drlg. sdy. sh. 8,067 ft.; top gas sd. 8,063 ft.; T.D. 8,783 ft.; P.B. 8,088 ft.; swbg.

Goose Creek—Harris County

Bob Foster No. 1 Esenhour, Wm. Scott Sur. S.D. 2,257 ft.
Sun Oil Co. No. 1 A. Smith, Wm. Scott Lower Lge. Drlg. S.W. sd. 5,000 ft.

Fairbanks—Harris County

Amerada Pet. Corp.-Stanolind O. & G. Co. No. 1 W. Jacobs, Blk. 1, sec. 2, W.C.R. R. Sur. 10¾-in. csg. 1,430 ft.; T.D. 7,256 ft.; P.B. 6,835 ft.; perf. csg. 6,824-28 ft.; flwd. oil and some S.W.; made squeeze job; W.O.C.

Humble—Harris County

Texas Co. No. 273 Landslide, Robt. Dunman Sur. 10-in. csg. 706 ft.; T.D. 3,602 ft.; 7-in. csg. 3,172 ft.

Pierce Junction—Harris County

A. & P. Production Co. No. 9 Whitehead, J. Hamilton Sur. No. 51. Drlg. sh. 4,420 ft.
Gulf Oil Corp. No. 42 Taylor, J. Hamilton Sur. T.D. 3,896 ft.; I.P. 340 B.P.D.; ¼-in. ck.

South Houston—Harris County

Smith and McDannald No. 2 L. R. Phillips, Lot 146, H.T.&B. Sur. No. 6. Drlg. sh. and L. 2,903 ft.
Stanolind O. & G. Co. No. 1 Bennett, Unit 13, H.T.&B. Sur. No. 6. 16-in. csg. 90 ft. T.D. 1,484 ft.; W.O.C.
Stanolind O. & G. Co. No. 2, Dist. No. 23. T.D. 4,133 ft.; P.B. 2,200 ft.

Tomball—Harris County

Amerada Pet. Corp. and Stanolind O. & G. Co. No. 2 W. W. Baker, J. House Sur. T.D. 1,098 ft.; W.O.C.
Humble O. & R. Co. No. 6 W. H. Gossett, E. Smith Sur. T.D. 5,543 ft.; 5½-in. csg. 5,537 ft.
Humble O. & R. Co. No. 5 F. T. Heis, C. N. Pilot Sur. T.D. 5,554 ft.; 5½-in. csg. 5,486 ft.
Humble O. & R. Co. No. 5 W. E. Hoffman, J. House Sur. T.D. 5,593 ft.
Humble O. & R. Co. No. 4 J. Mahaffey, J. Pruitt Sur. Drk.
Humble O. & R. Co. No. 1 M. W. Stebly, J. Pruitt Sur. Drk.
Shell Petroleum Corp. No. 2 Keys, J. Pruitt Sur. T.D. 5,568 ft.; fsg.

Ganado—Jackson County

Texas Co. No. 1 Hultquist, D. Dempsey Sur. 10-in. csg. 1,210 ft.; T.D. 5,140 ft.; 7-in. csg. 5,108 ft.

Amelia—Jefferson County

Humble O. & R. Co. No. 1 J. H. Deer et al, Unit 51. T.D. 6,779 ft.; 5½-in. csg. 6,774 ft.
Humble O. & R. Co. No. 1-A J. A. Dishman. T.D. 6,781 ft.; 5½-in. csg. 6,778 ft.
Humble O. & R. Co. No. 1-B Dishman, C. Williams Sur. Drlg. sh. 6,111 ft.
Humble O. & R. Co. No. 1-D Dishman, Unit 31. T.D. 6,777 ft.; 5½-in. csg. 6,772 ft.
Humble O. & R. Co. No. 1-F Dishman, Blk. C. T.D. 6,779 ft.; 5½-in. csg. 6,776 ft.
Humble O. & R. Co. No. 1-B Ephlin, Lot 18, Blk. D, C. Williams Sur. Abd. 6,800 ft.
Humble O. & R. Co. No. 2-B Pinchback, C. Williams Sur. Drlg. sh. 1,329 ft.
Humble O. & R. Co. No. 6 Guinn, C. Williams Sur. Drlg. sh. 4,040 ft.
Humble O. & R. Co. No. 3 Langham, C. Williams Sur. 9⅝-in. csg. 1,041 ft.; T.D. 6,781 ft.; I.P. 626 B.P.D.; ¼-in. ck.
Humble O. & R. Co. No. 4 Phelan, C. Williams Sur. T.D. 6,779 ft.; 5½-in. csg. 6,776 ft.
Glenn H. McCarthy No. 5 Longe, H. Williams Sur. T.D. 5,412 ft.; I.P. 53 B.P.D.; ½-in. ck.
Glenn H. McCarthy No 6 Longe, H. Williams Sur. R.U.
Normandie Oil Co. No. 2 R. J. Peveto, C. Williams Sur. Drlg. sh. 6,535 ft.
Stanolind O. & G. Co. No. 1 J. W. Hall, H. Williams Sur. T.D. 6,103 ft.; perf. csg. 6,099-6,101 ft.; perf. csg. 5,352-67 ft.; swabbing.
Stanolind O. & G. Co. No. 1, McCormick Sur. 10¾-in. csg. 1,629 ft.; T.D. 5,385 ft.; 7-in. csg. 5,350 ft.; I.P. 332 B.P.D.; ¼-in. ck.
Stanolind O. & G. Co. No. 2 Sargi, H. Williams Sur. 16-in. csg. 60 ft.; T.D. 6,100 ft.; 7-in. csg. 6,020 ft.; P.B. 6,016 ft.; perf. csg. 5,982-86 ft.; tstg.
Stanolind O. & G. Co. No. 3 Sargi, H. Williams Sur. R.U.

Big Hill—Jefferson County

Stanolind O. & G. Co. No. 2 M. E. Fitzhugh, Wm. McFaddin Sur. Drlg. sh. 2,810 ft.
Stanolind O. & G. Co. No. 4-A Pipkin. T.&N.O. Sur. Drlg. sh. 1,103 ft.

Fannett—Jefferson County

Gulf Oil Corp. No. 8 Junker, Wm. Smith Sur. Drlg. sh. and L. 1,951 ft.

LaBelle—Jefferson County

Sun Oil Co. No. 1 John Ward, 933 ft. S of No. 2 Broussard, Wm. Burton Sur. 18⅝-in. csg. 109 ft.; T.D. 8,598 ft.; 9⅝-in. csg. 8,538 ft.; drlg. sh. 8,756 ft.

Nome—Jefferson County

Shell Petroleum Corp. No. 2 Texas Public Service Co., W. H. Aldridge Sur. T.D. 6,050 ft.; 5-in. csg. 6,022 ft.; I.P. 338 B.P.D.; ¼-in. ck.
Shell Pet. Corp. No. 3 Texas Public Service Co., W. Aldridge Sur. Drk.
Shell Pet. Corp. No. 1 Unit "B," M. E. Peveto Sur. T.D. 6,048 ft.; 5-in. csg. 6,008 ft.; I.P. 340 B.P.D.; ¼-in. ck.
Shell Pet. Corp. No. 2 Unit "B," M. E. Peveto Sur. Drlg. sh. 2,106 ft.
Sun Oil Co. No. 2 J. E. Burrows, J. Blair Sur. T.D. 6,050 ft.; I.P. 248 B.P.D.; ¼-in. ck.
Sun Oil Co. No. 1 A. J. Mouboules, J. Blair Sur. 10¾-in. csg. 1,062 ft.; T.D. 8,768 ft.; P.B. 8,175 ft.; tstd. S.W.; P.B. and sdtrkd.; T.D. 5,678 ft.; 7-in. csg. 5,630 ft.; swbd. S.W.; cutting lnr.
Sun Oil Co. No. 8 Paggi, J. W. Kirby Sur. Drlg. sh. 2,933 ft.

Cleveland—Liberty County

Gulf Oil Corp. No. 18-C Kirby, J. Pleasant Sur. R.U.

Esperson—Liberty County

General Crude Oil Co. No. 29 Moores-Bluff, M. Dunman Sur. Drlg. sd. 2,903 ft.

Hull—Liberty County

Bishop Oil Co. No. 1 C. R. Wilson, J. Devore Sur. Oil sd. 780-88 ft.; T.D. 4,127 ft.; 7-in. csg. 2,204 ft.
Hamil and Smith No. 1 Barngrover, J Devore Sur. Drlg. sh. 6,631 ft.
Republic Prod. Co. No. 162 Dolbear, J. Devore Sur. T.D. 2,960 ft.; P.B. and sdtrkd.; drlg. rock 2,919 ft.
Texas Co. No. 1 Hannah fee, J. DeVore Sur. R.U.
Texas Co. No. 7 Hannah fee, J. Devore Sur. R.U.

Markham-Matagorda County

Turman Oil Co. No. 2 Hamil and Hamil, T. E. Hudson Sur. T.D. 520 ft.; W.O.C.

Bay City—Matagorda County

Hamman Expl. Co. No. 2 Cleveland, E. Hall Sur. Drlg. sh. 7,555 ft.

Palacios—Matagorda County

Glenn H. McCarthy No. 1 Foley Land Co., L. Goodwin Sur. Drlg. sh. 7,611 ft.

Hawkinsville—Matagarda County

Sun Oil Co. No. 2 Craig, T. Williams Sur. Top salt 796 ft.; base salt 2,099 ft.; 18⅝-in. csg. 2,174 ft.; 13⅜-in. csg. 3,700 ft.; 9⅝-in. csg. 5,689 ft.; T.D. 5,969 ft.; hole cleaned; P.B. and sdtrkd.; drlg. sh. 5,959 ft.

Van Vleck—Matagarda County

Skelly Oil Co. No. 2 Johnson, M. Cummins Sur. Drlg. sdy. sh. 6,050 ft.

Orange—Orange County

Texas Co. No. 12 A. J. Kuhn, T. J. Nolgrass Sur. Drk.

Livingston—Polk County

Ownby Drlg. Co. No. 10 Pratt, A. Viesca Sur. T.D. 4,220 ft.; swbd. in; showed gas; shut in.

Segno—Polk County

J. K. Dorrance No. 1 Sarah F. Wing, I.&G. N. Sur. No. 15. Drlg. 5,195 ft.; 7-in. csg. 5,177 ft.; split csg.; 5-in. csg. 5,177 ft.; I.P. 434 B.P.D.; ¼-in. ck.
J. K. Dorrance No. 2 Wing, I.&G.N. Sur. No. 15. R.U.
J. K. Dorrance No. 4 Wing, I.&G.N. Sur No. 15. 7-in. csg. 5,247 ft.; T.D. 5,247 ft.
Gulf Oil Corp. No. 1 Ragan, I.&G.N. Sur. No. 15. Drlg. sh. 3,000 ft.
Gulf Oil Corp. No. 2 Wing, I.&G.N. Sur. No. 15. Loc
Humble O. & R. Co. No. 3-B Kirby Lbr. Co., Marcell Victor Sur. T.D. 5,342 ft., sd.; flwd. 21 bbls. P.L.O. per hr. on ¼-in. ck.
Laquinta Oil Co. No. 2 Wing, I.&G.N. Sur. No. 15. T.D. 5,194 ft.; run 7-in. csg. I.P. 18 B.P.H.; ¼-in. ck.
Rajo Oil Corp. No. 1 Wing, I.&G.N. Sur. No. 15 T.D. 5,198 ft.; 7-in. csg. 5,182 ft.; I.P. 145 B.P.D.; ¼-in. ck.

Quintana-O'Connor-Greta—Refugio County

Cosmo Pet. Co. No. 16 Heard, Blk. 119, Refugio Townsite. T.D. 4,937 ft.; tested dry, deepening.
Hewitt and Daugherty No. 46 Lambert, J. M. Swisher Sur. T.D. 5,900 ft.; tstg.
Nordan and Morris No. 7 O'Connor, J. Hewitson Sur. Drlg. sh. 1,211 ft.
Nordan and Morris No. 10 O'Connor, J. Hewitson Sur. Core sd. S.O.&G.
Quintana No. 6 Heard, Webb Sur. T.D. 5,925 ft.; W.O.C.
Quintana No. 15-C Tomoconnor, Swisher Sur. T.D. 5,984 ft.; I.P. 600 B.P.D.; ¼-in. ck.
Quintana Oil Co. No. 48-A Tomoconnor, Swisher Sur. T.D. 5,940 ft.; I.P. 1,430 B.P.D.; ¼-in. ck.
United Gas Co. No. 49 Lambert, Swisher Sur. T.D. 5,915 ft.; I.P. 440 B.P.D.; ¼-in. ck.
United Gas Co. No. 52 Lambert, Swisher Sur. Drlg. sh. 4,665 ft.
United Gas Co. No. 54 Lambert, J. M. Swisher Sur. Drlg. 1,510 ft.
United Gas Corp. No. 12 J. J. O'Brien, Jr., csg. 8,357 ft.
United Gas Co. No. 9, Ryals Townsite. Drlg. 1,210 ft.
United Gas Corp. No. 42 Tomoconnor, Swisher Sur. Drlg. sh. 5,267 ft.

Spurger—Tyler County

Republic Production Co.-Houston O. Co No. 3 Hurd, N. Hurd Sur. 10¾-in. csg. 2,331 ft.; drlg. sdy. sh. 4,512 ft.

Keeran—Victoria County

Gulf Oil Corp. No. 11 J. M. Keeran, M. DeLeon Sur. Drlg. sh. 6,140 ft.
Union Oil Co. of Calif. No. 4 Keeran, M. DeLeon Sur. T.D. 6,004 ft.; perf. csg. 5,618-21 ft.; tstg.

McFadden—Victoria County

Transwestern Oil Co. No. 3 J. A. McFadden, Julus Varian Sur. Drlg. sh. 5,012 ft.

Placedo—Victoria County

Barnsdall-American Liberty Oil Co., S.A. &M.G. Sur. No. 7. Drlg. sh. 4,735 ft.
Barnsdall-American Liberty Oil Co. No. 10 J. M. Pickering, Wm. Rupley Sur. T.D. 7,240 ft.; attempted D.S.T.; failed.
Lion O. & R. Co. No. 3 S. W. Wright, S.A.&M.G. Sur. T.D. 4,775 ft.; W.O.C.
Magnolia Petroleum Co. No. 8 Sklar, S.A.&M.G. Sur. No. 17. T.D. 4,766 ft.; tstg.
Magnolia Pet. Co. No. 9 Chas. Sklar, S.A. &M.G. Sur. Drk.
Portilla O. & G. Co. No. 1 T. P. Traylor, S.A.&M.G. Sur. No. 11. Drlg. sh. 6,050 ft.
Salt Mount Oil Corp. No. 1 O. A. Lola, Wm. Rupley Sur. T.D. 4,806 ft.; 7-in. csg. 4,805 ft.
Shell Pet. Corp. No. 5 Houston Natl. Bank, S.A.&M.G. Sur. Drlg. sh. 4,180 ft.
Superior Oil Prod. Co. No. 8, J. J. Hosek, S.A.&M.G. Sur. No. 1. T.D. 4,765 ft.; 7-in. csg. 4,756 ft.; I.P. 192 B.P.D.; ¼-in. ck.
Superior-Gillespie No. 9 J. J. Hosek, S.A.& M.G. Sur. Drlg. sh. 4,243 ft.
Superior Oil and Gillespie No. 10 J. J. Hosek, S.A.&M.G. Sur. T.D. 1,050 ft.; W.O.C.
Superior Oil Co. and Gillespie No. 5 J. J. Hosek, S.A.&M.G. Sur. No. 7. T.D. 4,759 ft.; 7-in. csg. 4,754 ft.; I.P. 120 B.P.D.; ¼-in. ck.

Clay Creek—Washington County

Oak Oil Corp. No. 1 G. Cockrell, J. F. Perry Square Sur. S.D. 952 ft.
Sun Oil Co. No. 6 Droger, J. Perry Sur. Drlg. sdy. sh. 3,240 ft.
Virginia Oil Co. No. 1 Joe Kenieczny, S. M. Williams Sur. 10¾-in. csg. 104 ft.; T.D. 2,171 ft.; P.B. to 500 ft.

Five Corners—Wharton County

Texas Co. No. 7-B Pierce Est., J. Caldwell Sur. T.D. 5,555 ft.; 7-in. csg. 5,554 ft.; flwd. oil and S.W.; squeezed off bttm. with cmt.

Louise—Wharton County

C. E. Oil Co. No. 1 R. C. Fair, Morris and Cummins Sur. No. 290. Drlg. sh. 912 ft.
Pure Oil Co. No. 4 Wallace, Houston, T. W. Hurd Sur. No. 28. Drk.
Pure Oil Co. No. 6 McIntyre, Morris and Cummins Sur. No. 288. 9⅝-in. csg. 916 ft.; T.D. 5,160 ft.; 5½-in. csg. 5,160 ft abd.

Magnet—Wharton County

Atlantic Ref. Co. No. 1-B H. C. Cockburn, J. Smith and McKenzie Sur. Drlg. sh. 2,510 ft.
W. W. Van Allen-Texas Crusader No. 1 Sweet, J. Smith and McKenzie Sur. Drlg. sh. 4,206 ft.

Pickett Ridge—Wharton County

Texas Co. No. 33-A Pierce Est., G.B.&N Sur. No. 4; 9,000-ft. test. Drlg. sh. and L. 4,868 ft.

Spanish Camp—Wharton County

Albert Plummer-Felmont Oil Corp. No. 1 M. Sarrell, S. F. Austin Sur. No. 1. T.D. 4,015 ft.; S.W. sd.; 5-in. csg. 3,903 ft.; perf. csg. 2,910-20 ft.; comp. for gas well.

Withers—Wharton County

Texas Co. No. 28-C Pierce Est., Wm. Pettus Sur. T.D. 5,771 ft.; abd.
Texas Co. No. 29-C Pierce Est., Wm. Pettus Sur. 10-in. csg. 38 ft.; drlg. sh. 5,487 ft.
Texas Co. No. 30-C Pierce, Wm. Pettus Sur. Drlg. sh. 4,060 ft.

GULF COAST WILDCATS

Austin County

Cockburn et al No. 1 Forester, S. J. Sloan Sur. T.D. 3,743 ft.; fsg.
R. L. Hopkins No. 1 J. W. Recnecke, J. Stepheson Sur. Abd. 5,008 ft.

Brazoria County

Pure Oil Co. No. 1 P. M. Slade, S. F Austin Lge. T.D. 7,842 ft.; D.S. stuck; cutting and pulling drill plug.
Texas Co. No. 2 Robbins, James W. Brougham Sur. 13⅜-in. csg. 5,498 ft.; 9⅝-in. csg. 6,060 ft.; drlg. plug.

Colorado County

Coyle & Concord No. 3-B Powell, I.&G.N. Sur. No. 45. R.U.
Humble O. & R. Co. No. 1 Relaw Land Co., J. L. Duggan Sur. S.D. 3,758 ft.

Fort Bend County

John Byers No. 1 Lockwood-Sharpe, Wm. McMahon Sur. Drlg. 1,968 ft.
Marlen Oil Co. No. 1 Frank Jurca, sec. 26, H.&T.C. Sur. R.U.
Trone No. 2 Trone, H.&T.C. Sur. No. 67. Drlg. sh. 758 ft.

Harris County

H. J. DeArman et al No. 1 Tyrell-Garth, L. Hemmingway Sur. Abd. 7,028 ft.
Superior Oil Co. No. 1 Butler, Eehrhardt Sur. Drlg. sh. 6,875 ft.

Jackson County

George W. Greet et al No. 1 J. R. Davis, David Hoffman Sur. Drk.

Jefferson County

Magnolia Pet. Co. No. 1 J. H. Phelan, T.&N.O. Sur. No. 14. 13⅜-in. csg. 3,016 ft.; T.D. 8,578 ft.; will run csg. to test 8,350-8,460 ft.
H. B. Smith and R. Smith No. 1, J. W. McGaffey Sur. Loc.

Lavaca County

Welshire Union Oil Co. No. 1-A Pohl, F. Bass Sur. T.D. 3,250 ft.; P.B. 2,950 ft., two tests failed; S.D.

Liberty County

Jack Frazier et al No. 1 B. F. Haoachy Hughes B. Johnson Sur. 10¾-in. csg. 1,143 ft.

Matagorda County

Continental Oil Co. No. 2 Hawkins Est., D. McCarty Sur. 20-in. csg. 120 ft.; drlg. sd. 4,287 ft.
Royal O. & G. Corp. No. 1 T. J. Ewing, Burnett and Sojouner Sur. Drlg. sh. 3,100 ft.
United North & South Development Co. No. 1, J. S. Cotton Sur. T.D. 9,895 ft.; 7-in. csg. on bttm.; tstd. S.W. 9,769-81 ft.; squeeze off perfs.; perf. csg. 9,829-47 ft.; swbd. to 5,000 ft.; no results.
United North & South Dev. Co. No. 1 L. L. Lambert, G. B. M. Cotton Lge. Sur. Bldg. road.

Montgomery County

C. E. Gates No. 1 South Texas Long Leaf Lbr. Co., Walker Co. Sch. Ld. Drlg. sh. 1,598 ft.
Texas Co. No. 1 Lelia Crawford, V. Springer Sur. M.I.M.

Polk County

T. J. Wood et al No. 1 Bertrand, A. Hodge Sur. T.D. 5,370 ft.; abd.

San Jacinto County

Cockburn Oil Corp. et al No. 1 Whitten, Wm. West Sur. R.U.

Trinity County

McArthur & Nixon No. 1 Kountze, J. A. Hankins Sur. Run csg. 1,438 ft.
West Prod. Co. No. 1 Texas Long Leaf Lbr. Co., John Williams Sur. Drlg. sh. 4,430 ft.

Victoria County

Rowan and Hope No. 1 Knolle, C. W. Willsery Sur. T.D. 310 ft.; W.O.C.

Walker County

Garland, Hartman & Page No. 1 Carey Ld. & Dev. Co., D. M. McDonald Sur R.U.

Waller County

Stanolind O. & G. Co. No. 1 Wm. Hargrove, T. S. Reese Sur., sec. 110. 10¾-in. csg. 2,510 ft.; T.D. 7,500 ft.; 7-in. csg. 7,295 ft.; comp. for gas well.

Washington County

K. D. Harrison and C. E. Starr No. 1 Charles and Wm. Ellerman, Wm. Bridges Lge. 13-in. csg. 290 ft.

Wharton County

Smith and McDannald No. 1 Martin, I.& G.N. Sur. No. 16. Drlg. sh. 5,700 ft.

S. W. TEXAS WILDCATS

Aransas County

Barnsdall Oil Co. No. 2 Kate Edwards, 330 ft. S line, Lot 85, 660 ft. SW No. Wm. Lewis Sur. D.S.T. 8,010-29 ft.; rec. S.W.; unloading 3,000 ft. wtr. cushion; cg. ahead 8,081 ft.
Danray Oil Co. No. 1 Davis, Tr. 5, Wm. Boyd Sur. R.U.

Atascosa County

L. G. Priest No. 1 Bridwell, Tr. 45, Gorman Sur. Drlg. 1,113 ft.

Bastrop County

Marts & Beavers No. 1 Harris, McKean Sur. Drlg. 1,721 ft.

R. Pulliam No. 1 Yoast, Garcia Sur. R.U.

Bee County

Butler & Turner No. 1 Scott, Sec. 7, Howeth & Singer Sur., Uranga Gr. Cg. sh. 4,435 ft.
Illinois Pet. Co. No. 1 Harris, Blk. 4, Catlett & O'Neill Sur. Cg. sh. 3,213 ft.
R. B. Swiger No. 1 McKinney, L. C. Randolph Sur. Drlg. sh. 2,785 ft.

Blanco County

E. L. Nixon No. 1 Hornberger, 1,200 ft. S line, 300 ft. E line, Sur. 723. Drlg. 913 ft.

Brooks County

Gifford Oil Co. No. 1 Singer, Sur. 630. Cg. 2,383 ft.
Lynway O. Co. No. 1 Singer, Blk. 9, Sur. 436. R.U.
Standard of Tex. No. 1 Mestina, Mestina Lse. No. 3. S.D.; repairs; 4,214 ft.

Caldwell County

Crosby et al No. 1 fee, SW Lockhart Ed. L. sat. 1,843-47 ft.; set csg.
F. & W. Drlg. Co. No. 1 Rodenberg, J. Berry Sur. Set sur. csg.; W.O.C.
Housel Oil Co. No. 1 Driscoll. Drlg. 1,620 ft.
C. R. Richardson No. 1 Patterson, S. Pettus Sur. Drlg. 682 ft.
G. C. Richardson No. 1 Trammel, E. Berry Sur. M.I. rig.
Sherman Nelson No. 1 Etheridge, T. Hunter Sur. T.D. 2,180 ft.; R.U.; W.O.O.

Cameron County

Ruez-Morton No. 1 United Land Irr. Co., Lot 7, Blk. 402, El Jardin Subd. Spd.
Saxet Prod. Co. No. 1 Port Isabel Irr. Co. 600 ft. N line Loma Alta Lake, Sh. 2a Espiritu Santa Gr. Spudded and Stdg
Stapper Petroleum Corp. No. 1 Port Isabel rrigation Co., Blk. 17, P.I.I.Co. Subd Santo Gr. S.D.; boiler repair; 7,794 ft.

DeWitt County

Caldaboard Oil Corp. No. 1 Afflerbach, 1,000-ac. tr. T.D. 4,617 ft.; D.&A.

Dimmitt County

Wilcox O. & G. Co. No. 1 Light ranch, 330 ft. N and E line, sec. 67. Drlg. 6,045 ft.

Duval County

Kepley Prod. Co. No. 1 Sevier, sec. 71, Rafael Roselia Gr. Spd. in.
King Drlg. Co. No. 1 Parr, San Andres Gr. R.U.
Geo. Viterio No. 1 E. E. Cadena, Blk. 6, Cadena Ranch Subd., Hinojosa Gr. Drlg. sh. 5,335 ft.

Edwards County

Auld, Dodson & Lyman No. 1 Rigsby, sec. 16. Drlg. 3,046 ft.

Frio County

Amerada Pet. Corp. No. 1 Harriman Flores Sur. 306. Lost hole; drlg. sdtrk. hole 3,395 ft.
Pagenkoff & Jamieson No. 2 Blackaller, Gourley Sur. 765. Loc.

Goliad County

Goliad Oil Corp. No. 1 Cole, 206 ft. W line, CN&SL, Lot 33, Goliad Town Trs. Blew out at 5,545 ft., T.D.; made gas through blowout preventer take-off; S.D.; W.O.O.

Guadalupe County

J. K. Blackman No. 1 McKay, Hodges Sur. Drlg. 2,659 ft.
J. K. Blackman No. 1 Appling, Hodges Sur. Drlg. 261 ft.
Byrd Oil Co. No. 1 Schueneman, G. Dewitt League. Cg. chalk.
J. E. Clark No. 1 Knodel, G. DeWitt Sur. Drk.
J. E. Clark No. 1 Schneider, J. Cantu Sur. Drk.
Louis Crouch No. 1 King, J. D. Clements Sur. R.U.
Fair et al No. 1 Hemple, Williams Sur. Drlg. 1,657 ft.
Lincoln Pet. Co. No. 1 Baenzinger, Mansola Sur. Set csg. 1,990 ft.; drlg. plugs.
Robertson et al No. 1 Blumberg, M. Baker Sur. Drlg. 1,026 ft.

Hidalgo County

Young & Bonneau No. 1 Diaz, Tr. 331, Porc. 40. Cg. sd. 3,107 ft.

Jim Hogg County

Cole Pet. Co. No. 1 Yeager, Sur. 452. D.&A. 3,258 ft.
Nordan & Morris No. 1 Badger, SW¼ Sur. 640. D.&A. 2,611 ft.
Sheppell O. Co. No. 1 Thompson, Blk 2, Sh. 2, Las Animas Gr. Drlg. 1,167 ft.

Jim Wells County

Magnolia Pet. Co. No. 7 Seeligson, 10,433-ac. tr., Los Jaboncillos Gr. Drlg. 2,925 ft.
Wellington Oil Co. No. 1 C. D. Sevier, 5,877 ft. E line, 5,525 ft. S line, Lola Gr. Drlg. 4,435 ft.

LaSalle County

W. H. Vernor No. 1 Las Abras ranch, sec. 726 (W.O.). Old T.D. 800 ft.; M.I. rig to deepen.

Live Oak County

R. A. David No. 1 Mac Bach, 423-ac. tr., Hays Sur. R.U.
Empire G. & F. Co. No. 1 Geo. West, Lot 107, Blk. "B," G. West Subd. D.&A. 3,059 ft.
Loma Oil Co. No. 1 Terrill, Houlihan Sur. Drk.
S. E. Wilson No. 1 Southwestern Life Ins. Co., NE¼, NW¼, Blk. 57, Simmons City Subd. D.&A. 4,630 ft.

McMullen County

Howell Oil Corp. No. 1 Martin, Sur. 213. Drlg. 1,907 ft.
W. L. Hurds No. 1 Rhodes, NE¼, NW¼, sec. 54. R.U.
E. M. Jones No. 3 Ezell, SE¼, sec. 3, Ezell ranch. D.S.T. 1,533-47 ft.; rec. 750 ft. P.L.O. in 15 min. ⅜-in. ck.; rng. csg.; T.D. 1,547 ft.
Rowan & Hope No. 1 Rhodes, NE¼ sec. 18, Seale & Morris Sur. M.I.M.

Milam County

Kingdor Expl. Co. No. 1 White, B. Wickson Sur. Spd. and S.D.

Nueces County

Clarkwood Oil Co. No. 1 H. B. Baldwin, Blk. 11, Russell Farm Lots. Cg. 6,863 ft.
Gillock et al No. 1 Poenisch, Lot 11 sec. 32. M.I.M.
Navarro Oil Co. No. 1 Poenisch, Lot 21, sec. 14. M.I.M.
Green River Oil Co. No. 1 Cassens, sec. 26, Longorio Sur. Spudded.
Phillips Pet. Co. No. 1 Harney, Sh. 11, Gregoria Farias Gr. (W.O.). Cg. 5,245 ft.
Seaboard Oil Corp. No. 1 James Luby, Blk. 4, Mary Luby Subd., Petronilla ranch. D.S.T. 4,319-39 ft.; rec. 250 ft. oil, 125 lbs. in 10 min.; sd. 4,319-39 ft.; drlg. ahead 4,639 ft.
Southern Minerals Corp. No. 1 R. King, sec. 32, King Farm Lots. Sd. 6,515 ft.; tried to blow out; killed; stuck D.S.
Taylor Pet. Co. No. 1 Stiles, Blk. 14, sec. 18, Petronilla ranch. Cg. 4,527 ft.

San Patricio County

Conroe Drlg. Co. No. 1 Foley, SE¼, Blk. 42, Delmos Sur. Spd.

Starr County

Calderoni-James-Follette No. 1 Rodriguez, Blk. 6, Sh. 56, Porc. 80. Set sur. csg. 100 ft.; W.O.C.
Cook, Morris & Arnold No. 2 S.C.C.C., Blk. 23, Porc. 89. S.D. 1,980 ft.
Donroy Oil Co. No. 1 Ramon, 2,400 ft. SE line, 150 ft. SW line, sec. 150. Cg. 1,281 ft.
Henry Mode et al No. 1 Kelsey-Bass, Blk. 7, Porcs. 86 and 87. S.D. 990 ft.
Schwab & Foster No. 1 Munoz, 1,478-ac. tr., El Javali Gr. Cg. 2,109 ft.
Transwestern Oil Co. No. 2 Slick, 330 ft. N and E lines, sec. 527. T.D. 5,659 ft.; drlg. sdtrkd. hole. 5,665 ft.

Webb County

Bishop Oil Co. No. 1 Bruni Est., Blk. 8. Sur. 8. Loc.
Bolling & Coffey No. 1 South Texas C. Co., Sur. 768. Cg. 1,898 ft.
C. H. Brady No. 1 Garcia, Sur. 786. Loc.
C. C. Bonner No. 2 Cuellar, Sh. 4, Jose Cuellar Gr. Drk.
Dolores Oil Co. No. 1 Adami, SE¼, Sur. 15. Drlg. 1,021 ft.
Eugene Garner No. 2 Saldivar, Blk. 12. Sur. 567. Oil sd. 997-1,000 ft.; recmtg. csg.
J. W. Magee No. 1 Garcia, Blk. 21, James Subd. R.U.
Paul Meaders No. 1 Garcia, Sur. 338. Loc.
Mills Bennett Prod. Co. No. 3 Slator, Blk. 92, Slator ranch, Borrego Gr. Loc.
F. M. Shaver No. 1 Trafton, Sur. 281. R.U.

Willacy County

Ruez-Morton, Inc., No. 1 F. Armendiaz, C Lot 9, Sh. 4, San Juan de Carricitos Gr. Drlg. 537 ft.
Ruez-Morton, Inc., No. 1 Johnson-Stillman, Lot 14, Blk. 25, Sh. 44, San Juan de Carricitos Gr. S.D. 643 ft.

Wilson County

Maryland Oil Co. No. 1 Rice, 93-ac. tr., Mays Sur. Drlg. 3,025 ft.

Zapata County

Allison & Abrams No. 1 Vela, Sur. 249. R.U.
H. Guinn Lewis No. 1 S. Benavides, Blk. 39, Villa Gr. Cg. 2,137 ft.
J. O. Sheffield No. 1 Buck, Blk. 15, Sur. 273. Drlg. 127 ft.
Westheimer & Daube No. 1 Lopez, Sur. 288. T.D. 2,100 ft.; D.&A.

Zavalla County

Wilcox O. & G. Co. No. 1 Gillman, sec. 11. Set csg. 3,930 ft.; flwd. 75 B.P.H. shut in; bldg. stg.

S. W. TEXAS PROVEN

McCampbell—Aransas-San Patricio Counties

Atlantic Ref. Co. No. 2 Maryland Trust Co., 330 ft. N and E lines, Blk. 23. Set csg. 6,516 ft.; T.D., sh. 6,552½ ft.; jetting S.W. and oil; (fluid 95% S.W. and 5% oil); prep. deepen.
Atlantic Ref. Co. No. 1-B Murray, Lot 16, Blk. 12. Drlg. 5,050 ft.
Atlantic Ref. Co. No. 1 Porterfield, Lots 9 and 10, Blk. 14. Drlg. 3,625 ft.
Buckingham Oil Co. No. 7-A McCampbell, C E½, Lot 5, Blk. 42. Sd. 6,539-48 ft.; set 7-in. csg. 6,551 ft.; comp.; no gauge.
Buckingham Oil Co. No. 8-A McCampbell, "A" Lse., Blk. 42. Spdg. in.
Buckingham Oil Co. No. 3-B McCampbell, Blk. 40. Oil sd. 6,535-43 ft.; 6,546-52 ft.; comp.; no gauge.
Eleanor Oil Co. No. 1-A McCampbell, Blk. 58. Drlg. 6,721 ft.
Landreth Prod. Co. No. 1 McCampbell, Lot 4, Blk. 40. Sd. 7,105-20 ft.; comp.; 374 B.P.D. on ⅞-in. ck.
Rutherford & Eaton No. 2 Scrivner, Lots 13 and 14, Blk. 11. R.U.

North Dale—Bastrop County

Easton & Manning No. 1 Duran, S. Flint Sur. Loc.

Plummer—Bee County

Ann Oil Co. No. 2 Smith, J. R. Johnson Sur. S.D. 2,746 ft.
W. C. McBride, Inc., No. 1-B Plummer, Johnson Sur. Plug perf. 3,057 ft.

West Tuleta—Bee County

Saltdome Oil Co. No. 1 Striebeck, Blk. 3, sec. 20, Uranga Gr. Sd. 3,125-29 ft.; S.O. &G.; set csg. 3,123 ft.; W.O.C.

Von Ormy—Bexar County

Shadrock Oil Co. No. 10 Barragan, J. Simpson Sur. Drlg. 472 ft.

Alta Mesa—Brooks County

Standard of Texas No. 5 Mestina, Lease No. 1. Cg. ahead 3,923 ft.
Standard of Texas No. 6 Mestina, Lse. No. 1. Comp.; 135 B.P.D.; T.D. 3,002 ft.

Alta Verde—Brooks County

Wyrick Well Sur., Inc., No. 1 Singer, Sur. 436. R.U.

Luling-Branyon—Caldwell County

Fred Adams No. 8 Ellison, D. Cooper Sur. M.I.M.
Belcher No. 1 Fulcher. Set surf. csg.; W.O.C.
Blundell Oil Co. No. 3 Luce, J. Neill Sur. Set csg. 56 ft.; W.O.C.
Chiquita Oil Co. No. 5 Robertson, Neill Sur. R.U.
Easton & Manning No. 5 Lawler, J. Pinchback Sur. Set csg. 2,100 ft.; W.O.C.
Lanning & Coffield No. 2 Corder, J. A. Neill Sur. Drlg. 250 ft.
Lincoln Pet. Co. No. 3 Callihan, D. Cooper Sur. Drk.
Magnolia Pet. Co. No. 1 Tiller, Henry Sur. R.U.
R. Mallory No. 1 Browne, Miller Sur. Set csg. 1,925 ft.; W.O.C.
Martel Pet. Co. No. 1 MacMahon, J. Pinchback Sur. Set surf. csg. 2,180 ft.
Sherman Nelson No. 2 Branyon, D. Cooper Sur. Comp.; est. 200 B.P.D.; T.D 2,138 ft.
Sherman Nelson No. 1 Clark, Tiller Sur. Drk.
B. F. Robinson No. 1 Young, Miller Sur. R.U.
Taylor Ref. Co. No. 4-B Branyon, D. Cooper Sur. Drlg. 56 ft.
S. M. Vaughy No. 5 Flowers, Neill Sur. Drlg. 1,179 ft.
R. Wyrick et al No. 2 Magee, Neil Sur. R.U.

Buchanan—Caldwell County

Easton & Manning No. 2 Cude, Spillars Sur. R.U.
Edwell Oil Co. No. 3-A Cude, Wm. Spillars Sur. Drk.
L. G. Priest No. 1 Chambless, S. Goodman Sur. R.U.
Texas Gulf Pet. Co. No. 1 Medlin, Camon Sur. R.U.

Dunlap—Caldwell County

Kay Oil Co. No. 1 Dunlap, S. Seale Sur. Chalk 1,928-2,036 ft.; set csg.; W.O.C.
Stapper Pet. Corp. No. 1 Martin, A. Floyd Sur. R.U.

Salt Flat—Caldwell County

Chiquita Oil Co. No. 5 Hickman, G. Hinds Sur. R.U.
H. A. Pagenkopf No. 1 Hanson, J. Hinds Sur. Top Edws. 2,645 ft.; T.D. 2,648 ft.; comp.; 336 B.P.D.

Colmena—Duval County

Conservative Oil Co. No. 5 D.C.R.C., Blk. 8, Sur. 52. M.I.M.
Conservative Oil Co. No. 6 D.C.R.C., Blk. 12, Sur. 51. Sd. 1,442-48 ft.; comp.; 30 B.P.D.; T.D. 1,448 ft.
Magnolia Pet. Co. No. 1 D.C.R.C., sec. 49. Spd.
Wellington Oil Co. No. 5 D.C.R.C., Blk. 10, sec. 51. R.U.

Driscoll—Duval County

Continental Oil Co. No. 15-A Driscoll, sec. 448. Drlg. 1,287 ft.

Government Wells—Duval County

Central Producers, Inc., No. 4 Luptack, 50-ac. tr., Sur. 41. Loc.

Hoffman—Duval County

Relience Oil & Roy. Co. No. 2 Ruiz, Sur. 125. Drlg. 2,577 ft.

Kohler—Duval County

Bunn Bros. & Coates No. 5-B Peters, 81-ac. tr., sec. 29. Sd. 1,825-27 ft.; tstd. gas; sd. 1,829-35 ft.; odor oil and gas; set csg.; comp.; 66 B.P.D.
Chiquita Oil Co. No. 1 Peters, 162-ac. tr., Sur. 162. Stdg. with csg. set 100 ft.
Humble O. & R. Co. No. 59-A Kohler, Sur. 164. D.&A. 2,951 ft.

Labbe—Duval County

Humble O. & R. Co. No. 2 Ross, sec. 119. Set csg. on sd. 2,855 ft.; swbg. in sd. 2,849-55 ft.
Magnolia Pet. Co. No. 4 Labbee ranch, Sur. 1. T.D. 2,884 ft.; swbg. 2,879 ft.

Loma Novia—Duval County

F. J. Gravis No. 4 Hahl, Sur. 64. R.U.
Hamill & Smith No. 12-C Hahl, Sur. 63. Drlg. 2,417 ft.
Humble O. & R. Co. No. 13 Vela, Sur. 42. Drlg. sh. 2,687 ft.
Humble O. & R. Co. No. 16 Vela, sec. 42. T.D. 2,708 ft.; comp.; 7 B.P.H.
Magnolia Pet. Co. No. 15 Herbst, sec. 70. Set csg. 2,764 ft.; comp.; 42 B.P.D.; oil and S.W.
Texas Co. No. 5-B Ruiz, sec. 41. Set 7-in csg. 2,571 ft.; T.D. 2,579 ft.; comp.; 112 B.P.D.

Lopez—Webb-Duval Counties

W. C. Billings No. 3 fee, Sur. 2. Sd. 2,310-13 ft.; comp.; pmpg. 120 B.P.D.; T. D. 2,313½ ft.
W. C. Billings No. 4 fee, Sur. 2. Set sur. csg.; W.O.C.
Superior Oil Co. No. 21 Billings, Sur. 109. Sd. 2,288-99 ft.; comp.; 100 B.P.D.
Superior Oil Co. No. 22 Billings, Sur. 109. Sd. 2,278-83 ft.; set csg.; comp.; 90 B.P. D.; T.D. 2,285 ft.

North Sweden—Duval County

Argo Oil Co. No. 1 Carrillo, NE¼, sec. 9. R.U.
Arkansas Fuel Oil Co. No. 1 Vaello Puig, 330 ft. N and E line, sec. 10, Sweden Farm Lots. M.I.M.
Benedum & Trees Oil Co. No. 1 Puig, 330 ft. N and W lines, 750-ac. tr., San Andres Gr. D.S.T. 4,732-51 ft.; rec. 600 ft. oil; 60 lbs. W.P.; washing in.
Benedum & Trees Oil Co. No. 2 Puig, 750-ac. tr., San Andres Gr. Loc.
Frank Gravis No. 2 Vaello Puig, 990 ft. S line, 330 ft. W line lse., San Andres Gr. Sd. 4,784-96 ft.; set 4,871 ft.; W.O.C.
Highland Oil Co. No. 1 Farias, Sweden Farm Lots. Sd. 4,795-4,804 ft.; comp.; 124 B.P.D. on ⅛-in. ck.
Highland Oil Co. No. 2 Farias, sec. 9, Sweden Subd. M.I.M.
Parr Oil Co. No. 1 Vaello Puig, Sur. 24, S. Flores Gr. Sd. 4,784-96 ft.; set csg.; completing.
Parr Oil Co. No. 2 Puig, 150-ac. tr., Sur. 24, Santos Flores Gr. Loc.
Reynosa Oil Co. No. 1 Wilson, Blk. 9, Sweden Farm Lot. Cg. 4,729 ft.
Smith & Storey No. 1 Smith, Blk. 9, Sweden Farm Lots. Cg. sat. sd. 4,767 ft.
Standard of Kans. No. 1 Rossi, SE¼, Blk. 10, S. Flores Gr. Loc.

Palangana—Duval County

F. J. Gravis No. 2-A Schallert, Sur. 255. Set sur. csg.; W.O.C.
Penn Palangana Oil Co. No. 1 C. K. Gravis Sur. 250. Drlg. 3,455 ft.
Tuttle & Trahan No. 1 Megerle, Sur. 245. Drlg. 1,021 ft.

Piedra Lumbre—Duval County

Magnolia Pet. Co. No. 3 D.C.R.C., Sur. 203. Sd. 1,946-65 ft.; comp.; 60 B.P.D.
Texas Co. No. 23 D.C.R.C., SW¼, Sur. 100. Drlg. 467 ft.

Sarnosa—Duval County

Seaport O. & G. Co. No. 7-A D.C.R.C. Sur., W¼, sec. 574. Sd. 2,401-06 ft.; tstg.

Seven Sisters—Duval County

A. J. Brinkoeter No. 2 Garcia, Sur. 212. Set csg. 1,700 ft.; drlg. plugs.
Humble O. & R. Co. No. 15 Dowdy, sec. 272. Set csg. 2,578 ft.; completing.

Sweden—Duval County

Hiawatha Oil Co. No. 2 Herberger, SW¼, Blk. 14, Agua Poquita Gr. T.D. 5,914 ft.; P.B. sd. 5,072-91 ft.; perf. 5,080-84 ft.; completing.
Hiawatha Oil Co. No. 2 Miller, sec. 24, Santos Flores Sur. Loc.

Thomas-Lockhart—Duval County

Thomas Est. & Lockhart Bros. No. 2 Parr SW¼, sec. 26. T.D. 4,904 ft.; P.B. and set csg. 4,680 ft.; drlg. plugs.

Pearsall—Frio County

Amerada Pet. Corp. No. 1 Halff & Oppenheimer (W.O.). Old T.D. 6,312 ft.; recmtg. csg. 6,314 ft.
Amerada Pet. Corp. No. 8 Halff & Oppenheimer, S. A. Ditch Sur. 1,104 (W.O.). Drlg. 10,650 ft.
Amerada Pet. Corp. No. 1 Kothman, B. L. Crouch Sur. (W.O.). Old T.D. 4,370 ft.; T.D. 5,559 ft.; tstg.
Amerada Pet. Corp. No. 4 Smith, Mason Sur. 322 (W.O.). Old T.D. 6,238 ft.; R.U.

Clark—Guadalupe County

J. E. Clark No. 1 Knodel, G. DeWitt Sur. R.U.
Diamond Halff Oil Co. No. 2 Larison, G. DeWitt Sur. Spudded.

Darst Creek—Guadalupe County

Freeman Oil Co. No. 3 Larrison, G. DeWitt Sur. T.D. 2,700 ft.; dry; P.B. 2,450 ft.; W.O.C.
Saxet Prod. Co. No. 2 Wilson, G. DeWitt Sur. No. 13. Drlg. plugs in chalk.
V. G. Schimmel No. 1 Snyder, J. Cantu Sur. T.D. 2,036 ft.; D.&A.

Zoboroski—Guadalupe County

Louis Crouch No. 1 King, Clements Sur. Drlg. sh. 1,923 ft.
Donan et al No. 1 State, 30-ac. tr., on bank Guad. River. Set csg. 2,159 ft.; prep. test 2,214 ft.
Felmont Oil Co. No. 1 Schueneman, G. DeWitt Sur. Cg. chlk. 2,317 ft.
Ogden & Reed No. 1 Hoffman, G. DeWitt Sur. Drlg. 2,317 ft.

Samfordyce—Hidalgo-Starr Counties

Dean Bros. No. 1-C George, 20-ac. tr., Sh. 93, Porc. 41. R.U.
Ralph E. Fair, Inc. No. 4 Flores, 30-ac. tr., Tr. 250, Porc. 38. S.D.; repairs; 2,827½ ft.

Armagosa—Jim Hogg County

Texmalis & Reese No. 1 Earhart, John Suggs Sur. T.D. 4,000 ft.; S.D.; W.O.O.

Bentonville—Jim Wells County

Camp Prod. No. 1 Bird, Sh. 7-A, Abajo Gr. Drlg. 5,127 ft.
Camp. Prod. Co. No. 2-B Pope, N½, sec. 13, King Farm Lots. Spd.
Texon Drlg. Co. No. 2 Ralston, 990 ft. N line, 330 ft. W line, sec. 17. R.U.

Sandia—Jim Wells County

Geo. E. Smith No. 1 Wade ranch, Lot 1, Blk. "B," Bode Subd. Sd. 5,130 ft.; tried to blow out; set csg.; drlg. 5,725 ft.
Goe. E. Smith Drlg. Co. No. 2 Wade ranch, Lot 1, Blk. "B," Bode Subd. Set csg. 298 ft.; W.O.C.

West Fremont—Jim Wells County

C. G. Glasscock No. 2 Ritter, Lot 36, sec. 76. T.D. 2,358 ft.; flwg. fresh wtr.
Graham & Gilcrease No. 2-A Laughlin, C Lots 23 and 26, sec. 76. Completing 3,221 ft.
Graham & Gilcrease Oil Co. No. 2-B Laughlin, sec. 77. Cg. 2,211 ft.
Graham & Gilcrease No. 4 Laughlin. Lots 94 and 99, sec. 77. Cg. in second hole 2,351 ft.
Henshaw Bros. No. 1 McGuffin, W½, sec 230. R.U.
Premont Roy. Co. No. 1 Fealey, Lots 18 and 31, sec. 72. Drlg. below surf. csg.
Homer Presnall No. 1 Heron, Lots 22 and 27, sec. 72. Drlg. 1,521 ft.
Smith & Storey No. 1 Buldue, Lots 5 and 12, sec. 76. Sd. 2,350-51 ft.; comp.; est. 125 B.P.D.
Trio Oil Co. No. 1 Laughlin, Lots 33 and 48, sec. 77. Sd. 2,241-46 ft.; set csg. 2,235 ft.
Wenert et al No. 2 Thirkwell, Lots 50 and 63, sec. 77. Sd. 2,243-56 ft.; comp.; 100 B.P.D.

North Pettus—Karnes County

Magnolia Pet. Co. No. 14 Porter, Morris Sur. Sd. 3,658-66 ft.; set csg. 3,658 ft.; comp.; no gauge.
Magnolia Pet. Co. No. 15 Porter, B.&B. Sur. 25. Loc.

Kingsville—Kleberg County

Humble O. & R. Co. No. 9 Kleberg, Lot 2, sec. 40. Sd. 3,218-28 ft.; D.S.T. rec. 210 ft. oil, 200 ft. oily mud; W.P. 54 lbs. in 24 min.; T.D. 3,235 ft.; comp.; 25 B.P.D. on ⅛-in. ck.

Jacob—McMullen County

Loma Oil Co. No. 7-B Jacob, Sur. 15. D.&A. 1,052 ft.
National Pet. Co. No. 4-C Lark, Scrugham Sur., Blk. 129. M.I.R.

Loma Alta—McMullen County

J. T. Lanier No. 1 Hagist, SE¼, N½, Sur. 481. Drlg. 927 ft.

North Jacob—McMullen County

F. D. Salter No. 2 Griffith, Osborn Sur. Drlg. 365 ft.

Agua Dulce—Nueces County

United Prod. Co. No. 1 Harvey, 1,100 ft W line, 1,050 ft. N line, tr., M. Garza Sur. Set 5½-in. csg. 7,457 ft.; perf. csg. 7,375-84 ft.; flwg. 112 B.P.D. fluid, reported 25 to 30% oil, remainder S.W.; T.D. 9,003 ft.; recmtd. csg.; perftg. 7,375-84 ft.

Chapman Ranch—Nueces County

Seaboard Oil Corp. No. 5 Chapman, sec. 38, Laurells Farm Lots. Drlg. 4,325 ft.

Clara Driscoll—Nueces County

Magnolia Pet. Co. No. 4 Sevier, 80-ac. tr. Loc.

Flour Bluff—Nueces County

Humble O. & R. Co. No. 1 Brown, Blk. 28, sec. 48. Set csg. 6,670 ft.; W.O.C.
Humble O. & R. Co. et al No. 1 Downie, Lot 18, Blk. 48. Drlg. sh. 1,073 ft.
Humble O. & R. Co. et al No. 1 Duncan, Lot 6, sec. 41. Drlg. sh. 1,061 ft.
Humble O. & R. Co. et al No. 1 Dunn, Lot 6, Blk. 41. Sd. 6,634-63 ft.; comp.; 168 B.P.D. on ¼-in. ck.
Humble O. & R. Co. No. 5 Guiden, Lot 15, Blk. 47. Set csg. 6,669 ft.; W.O.C.
Humble O. & R. Co. et al No. 5-B Miller, Lot 19, Blk. 48. Set csg. 6,663 ft.; W.O.C.
Humble O. & R. Co. No. 1 F. G. and Kate Ritter, Lot 15, Blk. 55. Drlg. sd. 6,618 ft.
Humble O. & R. Co. No. 3 Robertsbn, Lot 11, Blk. 56. Drlg. sh. 6,400 ft.
Humble O. & R. Co. et al No. 5 Webb, Lot 10, Blk. 56. Set csg. 6,666 ft.; W.O.C.

London—Nueces County

Atlantic Ref. Co. No. 1 Stockton, SW¼, sec. 12. Loc.

Saxet Heights—Nueces County

Wm. Brady No. 1 Whelan, 56.9-ac. tr., Villareal Sur. Drlg. 2,325 ft.
Genro Drlg. Co. No. 1 Owens, Villareal Sur. Sd. 4,049-74 ft.; set 7-in. csg. 4,074 ft.; comp.; 50 B.P.D. on ⅛-in. ck.; T.D. 4,074 ft.
Harrison Drlg. Co. No. 1 Simms, 4-ac. tr., Villareal Sur. T.D. 4,097 ft.; P.B. and sdtrkd. 3,928 ft.; set csg. in sdtrkd. hole 4,098 ft.; stdg.
Harrison Drlg. Co. No. 2 Whelan, Villareal Sur. T.D. 3,400 ft.; S.D.
H. M. Reed No. 2 Quinn, 28-ac. tr., Villareal Sur. Drlg. 557 ft.
Roosth & Genecov No. 1 Rose, Lot 9, Blk. 11, Villareal Gardens. Set csg. 510 ft.; W.O.C.
Ben F. Smith No. 1 Snowden, 13-ac. tr., Villareal Sur. R.U.

Saxet—Nueces County

Allen & Morris No. 1-B Solar Sevier, Villareal Sur. Sd. 4,827-59 ft.; set csg.; W.O.C.
C. Andrade No. 9 McGregor-Belk, 130 ft. S line, 990 ft. E line, lse., Sur. 816. Cg. 6,297 ft.
Baltic Drlg. Co. No. 5 Harmon, Sur. 416. Drlg. 6,316 ft.
Baltic Drlg. Co. No. 6 Harmon, Sur. 416. Drlg. 2,045 ft.
Bentex Drlg. Co. No. 4 Harmon, 50-ac. tr., Sur. 416. Set condr. csg. 150 ft.; W.O.C.
R. B. Bryant No. 2 Frank, Sh. "C," Sur. 416 (W.O.). R.U.
R. B. Bryant No. 6 Harmon, Sur. 416. Drlg. 3,926 ft.
Conservative Oil Co. No. 3-B Morgan, Sur. 403. Oil sd. 6,914-28 ft.; set csg. 6,928 ft.; perf. 6,750 ft.; S.W.; perf. 4,048-52 ft.; S.D.; D.&A.; T.D. 6,928 ft.
Crown Central Pet. Corp. No. 4 Hunter, 159-ac. tr., Sur. 587. T.D. 4,813 ft.; set csg. 4,805 ft.
Crown Central Pet. Corp. No. 4 Page, 75-ac. tr., Page Lds. Sur. Drlg. 2,617 ft.
Donico Prod. Co. No. 2 Donnigan, 60-ac., tr., sec. 7, Rge. 6. Perf. 4,862-67 ft.; tstg.
Donico Prod. Co. No. 2 Donnigan, 60-ac. tr., sec. 7, Rge. 6. Drlg. 520 ft.
Floboots Oil Co. No. 1 Bliss, 25-ac. tr., Stevens Tr. Drlg. 5,115 ft.
Floboots Oil Co. No. 4 Humphries, Stevens Sur. W.O.; old T.D. 5,840 ft.; R.U. to D.D.
Gilcrease Oil Co. No. 3 Sullivan, 140-ac. tr., Thos. Gallagher Sur. S.D. 3,852 ft.; W.O.O.
L. Glasscock No. 2-B Johns, 20-ac. tr., MacGregor Sur. 582. Drlg. 2,715 ft.
Great States and Violet No. 9 McGregor-Belk, 73.6-ac. tr., sec. 311. Drlg. 6,649 ft.
Hiawatha Oil Co. No. 7 Griffith, 100-ac. tr., Sur. 416. Drlg. 6,311 ft.
Hiawatha Oil Co. No. 8 Hutchins-Stillwell, Lot 30, Sheppard Farm Lds. Sd. 6,888-7,004 ft.; perf. 6,886-92 ft.; cleaning into pits.
Hiawatha Oil Co. No. 9 Hutchins-Stillwell, Lot 34, Sheppard Lds. Sd. 6,542-58 ft.; perf. csg. 6,729-34 ft.; comp.; 50 B.P.D. dist.; perf. 6,736-41 ft.
Hiawatha Oil Co. No. 3-B Smith, Blk. 35, Sheppard Farm Lots. Drlg. 4,515 ft.
Hiawatha Oil Co. No. 5-B Smith, Blk. 35, Sheppard Farm Lots. Sd. 5,792-5,840 ft.; set csg. 5,840 ft.; comp.; est. 150 B.P.D. on 5/32-in. ck.
Houston Oil Co. No. 9 McGregor, 135-ac. tr., Sur. 582. Sd. 6,719-32 ft.; D.S.T. 6,727-32 ft.; rec. 550 ft. oil in 15 min.; W.P. 250 lbs.
Houston Oil Co. No. 23 Morgan, sec. 7, Rge. 5. Drlg. plug 4,425 ft.; completing.
Houston Oil Co. No. 24 Morgan, sec. 7, Rge. 5. T.D. 4,424 ft.; comp.; 180 B.P.D. on 5/32-in. ck.
Houston Oil Co. No. 26 R. Morgan, 493.63-ac. tr., sec. 7, Rge. 6. Spd.
H. H. Howell No. 4 Hutchins, 80-ac. tr., Sur. 416. T.D. 7,505 ft.; set csg. 6,798 ft.; tstd. S.W.; P.B. 5,800-ft. sd.; perf. 5,810-18 ft.; comp.; 120 B.P.D. on ⅛-in. ck.
H. H. Howell No. 5 Hutchins, 80-ac. tr., Sur. 416. Drlg. 4,221 ft.
H. H. Howell No. 3 Morgan, sec. 415. Cg. 6,697 ft.
H. H. Howell No. 2 Plachey, Sur. 25. R.U.
Kepley Prod. Co. No. 4 Donigan, 100-ac. tr., sec. 7, Rge. 6. R.U.
Morgan & Chapman Minerals Corp. No. 7 Morgan, NE¼, Sur. 405. Drlg. 5,117 ft.
Pan American Prod. Co. No. 6-B Sagarin, 82-ac. tr., Sur. 500. Drlg. 6,375 ft.
Pan American Prod. Co. No. 1-A Solar Sevier Sur. 582. D.S.T. 6,267-73 ft.; rec. 180 ft. oil and 5 ft. S.W.; W.P. 165 lbs.; 4 min.; set csg. 6,269 ft.; W.O.C.
Phillips Pet. Co. No. 1 Frank, 27.5-ac. tr., Sur. 500. Drlg. 6,012 ft.
Port O. & G. Co. No. 3 Cox & Cryder Sd. 3,814-28 ft.; set csg. 3,851 ft.; W.O.C.
Potter & Snowden No. 1 Kocurek, 26-ac. tr., Smith Sur. 25. Sd. 4,102-12 ft.
Potter & Snowden No. 1 Taggert, Blk. 5, Sur. 401. S.D. 4,679 ft.
Renwar & Maryland No. 1-A Rand Morgan, Sur. 415. O.W.W.O.; R.U. to deepen; old T.D. 5,825 ft.
Republic Nat. Gas Co. No. 5-A Donigan, 240-ac. tr., secs. 6 and 7, Rge. 6. Set csg. 4,600 ft.; W.O.C.
Republic Nat. Gas Co. No. 19 Dunn, Blk. 37, Sheppard Farm Lots. Set csg. 4,-861 ft.
Republic Nat. Gas Co. No. 3-A Morgan, sec. 405. Drlg. 1,780 ft.
Richardson Pet. Co. No. 18 Cain & Secrist, Lot 23, Russell Farm Trs. Sd. 4,-449-57 ft.; tstg.
Richardson Pet. Co. No. 2 Erwin, Sur. 500. Drlg. 2,415 ft.
Richardson Pet. Co. No. 5 Sedwick, Sur. 311. Set csg. 4,815 ft.; W.O.C.; T.D. 4,-902 ft.; perf. 4,418-28 ft.
Richardson Pet. Co. No. 9 Quiros, Blk. 36 Sheppard Lots. Set csg. 5,850 ft.; W.O.C.
Sancor Oil Co. No. 1 Isensee, Blk. 12, Sheppard Farm Lots, Sur. 313. Cg. 4,-390 ft.
Shell Pet. Corp. No. 4 Flato, Blk. 4, Sheppard Farm Trs. Sd. 4,541-48 ft.; comp.; 192 B.P.D. on 11/64-in. ck.
Southern Minerals Corp. No. 20 Bliss, 120-ac. tr., Sur. 416. Sd. 6,717-28 ft.; comp.; 129 B.P.D. on ¼-in. ck.
Southern Minerals Corp. No. 3 Elder, 60-ac. tr., Surs. 311 and 312. Set condr. csg.; W.O.C.
Southern Minerals Corp. No. 2 Stillwell, 60-ac. tr., 122-ac. tr., Sur. 311. R.U.
Texon Drlg. Co. No. 6 Kocurek, Sur. 316 Sd. 4,429-38 ft.; set csg.; comp.; 171 B. P.D.; T.D. 4,438 ft.
Texon Drlg. Co. No. 7 Kocurek, 156-ac. tr., Sur. 316. Set surf. csg.; W.O.C.
Texon Drlg. Co. No. 7 Ocker, 160.77-ac. tr., Sur. 316. Drlg. 3,912 ft.

Sullivan—Nueces County

Lockhart et al No. 1 O. Purl, Lot 2, sec 7, Ross Peters Subd. No. 2. Drlg. 5,-749 ft.

Midway—San Patricio County

Phillips Pet. Co. No. 1 Ivey, 990 ft. E line, 344 ft. S line, sec. K. Drlg. 4,347 ft.

Plymouth—San Patricio County

Heep Oil Corp. No. 7-E Welder, R. Montgomery Sur. T.D. 5,674 ft.; D.&A.
Humble O. & R. Co. No. 2 Blaschke & May, Lot 8, sec. 25, Fourth Addn. Set csg. 5,652 ft.; comp.; no gauge.
Plymouth Oil Co. No. 74-C Welder, sec. 71. Sd. 5,458-72 ft.; set csg.; W.O.C.
Plymouth Oil Co. No. 75-C Welder, sec. 70. Sd. 5,466-75 ft.; set csg.

Taft Field—San Patricio County

Cage Prod. Co. No. 9 Mayo, 60-ac. tr., Fessenden Sur. Sd. 3,996-4,007 ft.; set csg.; W.O.C.
Esves Oil Co. No. 7 Britton, sec. 6. Cg. 4,937 ft.
Humble O. & R. Co. No. 23 Mayo, Ottman Sur. Set csg. 4,364 ft.; W.O.C.

Barbacoas—Starr County

K. E. Merren No. 1-A S.C.C.C., Blk. 34, Lambeth Subd., Porc. 89. Set csg. 5,353 ft.; cg. sdy. sh. 5,395 ft.

Cuevitas—Starr County

Sun Oil Co. No. 9-B Guerra, 330 ft. S and E lines, B Lse., Cuevitas Gr. Cg. 1,721 ft.

Los Olmos—Starr County

St. Marys O. & G. Co. No. 1-E Kelsey-Bass, sec. 8, Porc. 76. Set 4-in. csg. 354 ft.

Margo—Starr County

Dolgener et al No. 1 Garcia, 10-ac. tr., Sh. 7-B, Porc. 71. Cg. sd. 411 ft.

Ricaby—Starr County

Moss & Heard No. 2 Ricaby, Porc. 83. (W.O.). S.D. 2,032 ft.; D.&A.

South Ricaby—Starr County

G. E. Dodd, Tr., No. 2-A Wood Est., Porc. 84. Sd. 1,740-45 ft.; set csg. 1,741 ft.; drlg. plugs.

Rio Grande City—Starr County

Clopton & Reed No. 1 Green, Porc. 80. T.D. 4,600 ft.; S.G.; P.B. 1,681 ft.; set csg.; W.O.C.
Clopton & Reed No. 4 Tijerina, Lot 12, Sh. 14-C, Porc. 80. Cg. 1,423 ft.

Bruni-Cole—Webb County

Highland Oil Co. No. 1 Bruni, Surs. 7 and 8. Sd. 3,422-34 ft.; comp.; 74 B.P.D.; T.D. 3,449 ft.
Highland Oil Co. No. 3-B Bruni, Surs. 7 and 8. Drlg. 1,579 ft.
O. W. Killam No. 52 Bruni, Blk. 20, Sur. 8. Set csg. 3,421 ft.; drlg. plugs.
Magnolia Pet. Co. No. 43 Brennan-Benavides, Blk. 11, Hale Subd. R.U.

Killam—Webb County

R. Killam No. 2 Garcia, Sur. 1,099. R.U.
O. W. Killam No. 2 Garcia, Sur. 1099. Sd. 2,033 ft.; tstg.
O. W. Killam No. 2 Laurel Bros., Blk. 28, sec. 333. Drlg. 510 ft.
Eugene Mays No. 1 Garcia, 120-ac. tr., Sur. 786. Loc.

O'Hern—Webb County

Magnolia Pet. Co. No. 27 Benavides, Blk. 31. Set csg. 2,830 ft.; comp.; 218 B.P.D. on ⅛-in. ck.; sd. 2,818-30 ft.
Magnolia Pet. Co. No. 28 Benavides, Hale Subd. Set csg. 2,879 ft.; W.O.C.
J. J. O'Hern No. 5-C Benavides. Drlg. 547 ft.
H. M. Reed No. 4 Benavides, Blk. 299, Hale Subd. Swbg. 2,916 ft.
Starr Dev. Co. No. 1 Benavides, 330 ft. N and W lines, Sur. 173. M.I.M.

LaSal Vieja—Willacy County

Shell Pet. Corp. No. 1 Yturria, Sh. 64, Carricitos Gr. (W.O.); set csg. 7,630 ft.; cg. sh. 10,013 ft.

Byersville—Williamson County

Taylor Ref. Co. No. 9-B Heap, H. White Sur. R.U.

Cuellar—Zapata County

Magnolia Pet. Co. No. 4 Cuellar, Sur. 245. Sd. 1,246-55 ft.; tested 750,000 ft. gas; comp.; gasser.
Magnolia Pet. Co. No. 5 Cuellar, Sur. 245. T.D. 1,313 ft.; D.&A.

Escobas—Zapata County

Earl Calloway No. 3 Bustamente, Sh. 8, Fansler Part. Sd. 192-99 ft.; comp.; 40 B.P.D.; T.D. 1,207 ft.
Earl Calloway No. 6 Bustamente, Sh. 8, Fansler Part. Drlg. 821 ft.
Cron & Gracey No. 8 Garcia, Blk. 10, Douglas Subd. T.D. 1,292 ft.; comp.; 33 B.P.D.
Gilbreath Bros. No. 2 Bustamente, Sh. 10, Fansler Part. Comp.; 8 B.P.D.; T.D. 1,-155 ft.
Gilbreath Bros. No. 3 Bustamente, Sh. 10, Comitas Gr. Drlg. 655 ft.
Matthews Drlg. Co. No. 13 Garcia, Sh. 3, Fansler Part. D.&A. 2,156 ft.
Nordan & Morris No. 18 Bustamente, Sh. 33, Fansler Part. Set csg. 1,202 ft.; comp.; 27 B.P.D.
Nordan & Morris No. 19 Bustamente, Sh. 33, Fansler Part. Comp.; 38 B.P.D.; T.D. 1,230 ft.
E. C. Reeves No. 2 Bustamente, Sh. 9, Fansler Part. Drlg. 127 ft.
Texas Pipe & Supply Co. No. 3 Bustamente, Sh. 9, Fansler Part. Comp.; 47 B.P.D.; T.D. 1,192 ft.
Texas Pipe & Supply Co. No. 4 Bustamente, Sh. 9, Fansler Part. T.D. 1,188 ft.; comp.; 40 B.P.D.
Texas Pipe & Supply Co. No. 5 Bustamente, Sh. 9, Fansler Part. T.D. 1,189 ft.; comp.; 42 B.P.D.
Texas Co. No. 100 Jennings, Cerrito Blanco Gr. R.U.

Lopeno—Zapata County

Dalport Oil Corp. No. 1 Vela, Porc. 20 T.D. 2,541 ft.; P.B. 2,448 ft.; set csg.; W.O.C.

EAST TEXAS

(Border Counties)

Cass County

American Lib. Oil Co. No. 2 E. T. Tyson, Cass Sch. Ld. Sur. Fsg. 38 ft.
Arkansas-Louisiana No. 1 George, Wm. R. Myers Sur. Comp.; 96,942,000 ft. gas; 2,290 lbs. R.P.; T.D. 5,980 ft.
G. H. Chamblee No. 1 Collett, J. S. Smith Sur., 20-ac. tr. M.I.M.
Gulf Prod. Co. No. 1 W. T. Henry, H. Owens Sur., NW cor. survey. Drlg. 2,-320 ft.
P. L. Hoffman No. 2 Davis, J. S. Smith Sur. Drlg. 3,050 ft.
Magnolia Pet. No. 3 W. M. Hall, Wilson Robinson Sur. Drlg.
Magnolia Pet. No. 4 W. M. Hall, John N. Jackson Sur. Drlg. 5,621 ft.
Magnolia Pet. No. 5 W. M. Hall, John N. Jackson Sur. Drlg. 5,419 ft.
Magnolia No. 1 Hayer & Thatcher, Jacob Carsner Sur. T.D. 5,965 ft.; tstg.
Magnolia Pet. No. 14 L. Haywood, P. Evans Sur. Comp.; flw. 468 B.P.D.; T.D. 6,035 ft.
Magnolia Pet. No. 15 L. Haywood, P. Evans Sur. Comp.; flw. 600 B.P.D.; T.D. 6,003 ft.
Magnolia Pet. No. 16 L. Haywood, P. Evans Sur. Drlg. 4,725 ft.
Magnolia Pet. No. 17 L. Haywood, P. Evans Sur. Comp.; flw. 520 B.P.D.; T.D. 6,050 ft.
Magnolia Pet. Co. No. 18 L. Haywood, P. Evans Sur. Drlg. 4,704 ft.
Magnolia Pet. Co. No. 19 L. Haywood, P. Evans Sur. Drlg. 4,736 ft.
Magnolia Pet. Co. No. 20 L. Haywood, P. Evans Sur. R.U.
Magnolia Pet. Co. No. 21, L. Haywood, P. Evans Sur. Drlg. 2,040 ft.
Magnolia Pet. Co. No. 22 L. Haywood, P. Evans Sur. Drlg. 4,622 ft.
R. W. Norton No. 5 Davis, H. Holbert Sur. Drlg. 3,550 ft.
R. W. Norton No. 1 L. E. Hardin, Dudley Gilleans Sur. Drlg. 4,174 ft.
R. W. Norton No. 6 Davis, H. Holbert Sur. Comp.; flw. 16 B.P.H.; T.D. 6,019 ft.
R. W. Norton No. 5 J. T. Moore, J. S. Smith Sur. Drlg. 200 ft.
Ohio Oil Co No. 13 R. P. Willis, S.F.I.W. Sur. No. 1263. 7-in. 5,941 ft.; T.D. 5,955 ft.; W.O.C.S.
Ohio Oil Co. No. 19 R. P. Willis, S.F.I.W. Sur. Drlg.
J. G. Puterbaugh et al No. 1 Doorley, Calloway Davis Sur., 14 mi. N of Rodessa. T.D. 6,500 ft.; D.&A.
W. G. Ray Drlg. Co. No. 1 Parker, G. Crowder Sur. Drlg. 4,647 ft.
Texas Co. No. 1 Chatten, Wm. R. Myers Sur. Drlg. 5,805 ft.
Texas Co. No. 8 McLeod. W. A. Elliott Sur. Tstg.; T.D. 6,111 ft.
Texas Co. No. 3 N. A. Rambo, Cass Cty. Sch. Ld. Sur. Drlg. 3,619 ft.
Texas Co. No. 4 N. A. Rambo, Cass Cty. Sch. Ld. Sur. Drlg. 3,874 ft.
N. K. Towns No. 1 Henry, H. Owens Sur. NW cor. Sur. Drlg. 4,119 ft.
United Gas No. 2 V. C. Bivens, J. Collom Sur. Drlg. 4,732 ft.
United Gas No. 1 Threwer, J. S. Smith Sur. Drlg. 4,491 ft.
United Prod. No. 2 Allday, 87 ac. trk. Drk.
United Prod. No. 6 Baugus Unit, R. Trammel Sur. 7-in. cmtd. 6,028 ft.; T.D. 6,-035 ft.; W.O.C.S.
United Prod. No. 2 Belote, H. Holbert Sur. Drlg. 3,916 ft.
United Prod. No. 2 J. Q. Clements, Wm. B. Hughes Sur. 7-in. 6,027 ft.; T.D. 6,-090 ft.; W.O.C.S.
United Prod. No. 1 W. W. Herner, J. S. Smith Sur., on 14-ac. tr. Drlg. 4,311 ft.
United Prod. Co. No. 1 J. W. Land, R. Potter Sur. P.B. to 6,533 ft.; 5,000,000 ft. gas; W.O.
United Prod. No. 1 M. R. Lennard, J. S. Smith Sur., on 17-ac. tr. Drlg. 4,334 ft.

Harrison County

Lever Oil Co. No. 2-B Vincent, Davenport Sur. T.D. 2,135 ft.; R.U. to D.D.

Marion County—Rodessa

Arkansas-La. Gas Co. No. 1 Allen Houston, A. D. S. Coy Sur. R.U.
Arkansas-Louisiana No. 1 C. C. Braden T. Hanson Sur. Drlg. 5,883 ft.
Arkansas-La. No. 1 Laura McIntosh, Edmondson Sur. Perf. csg. and acid; T.D. 5,980 ft.; tstg.
Fohs Oil Co. No. 1 Mary Reynolds, A. D. S. Coy Sur. R.U.
Hunter Co. No. 2 Fonda, A. D. S. Coy Sur. M.I.M.
United Prod. Co. No. 1 Hutchinson, A. D. S. Coy Sur. Loc.

Panola County

T. H. Dearing & Sons No. 1 Wooten Est., W. Mann Sur. Set surf. pipe.
Glassell & Glassell No. 1 Pierce & Chesbro, Julia Soape Sur. Drlg. 3,325 ft.
Magnolia Pet. Co. No. 2 E. A. Hull, Thos. Applewhite Sur. Drlg. 5,963 ft.

Shelby County

Wm. Redditt No. 1 Pickering Lbr. Co., SE cor. Stephens English Sur. S.D. 2,165 ft.; laying fuel line and prep. to D.D.
H. A. Stebbinger No. 1 Pickering Lbr. Co., on 160-ac. tr. in A. Hanson Sur. P.B. 5,126 ft. to 5,073 ft.; W.O.C.S.

NORTH TEXAS WILDCATS

Archer County

O. P. Darsey No. 1 J. T. Longley, sec. 1839, T.E.&L. Sur. Drlg. 810 ft.
S. & H. Drlg. Co. No. 1 C. A. Mangold, C. Wright Sur. Drlg. 600 ft.
H. M. Tebay No. 1 Richardson, J. Scott Sur. T.D. 1,240 ft.; to shoot and acidize.

Clay County

L. T. Burns No. 1 Sanzenbacker, L. N. Sparks Sur. A-401. Drlg. 3,382 ft.
Foster Minerals Corp. No. 1 V. H. Yarbrough M. Lassiter Sur. A-288. Drlg. 1,310 ft.
Walter H. Gant No. 3 C. M. Worsham, H. &T.C. Sur., Blk. 4. O.S. 3,920-27 ft.; est. 50 B.P.H.; S.D.; tanks.

Green Mt. Oil Co. No. 1 Staggs, sec. 34, A.C.S.L. Sur. S.D.O. 3,295 ft.

Collin County

F. Jones No. 1 Sherley, G. Morrison Sur. Drlg. 3,000 ft.

Cooke County

Denver P. & R. Co. No. 1 Solomon, W. G. Hunt Sur. A-493. Drlg. 3,520 ft.
V. E. Powell No. 1 D. B. Allred, G. DeLos Santos Sur. A-894. Drlg. 477 ft.
Sparks & Russell No. 1 C. F. Bundy, P. P. Cary Sur. A-1239. 6⅝-in. 2,090 ft.; W.O.C.
Texas Co. No. 1 J. F. Marshall, A. Burns Sur. A-49. Drlg. 1,850 ft.

Denton County

California Ref. Co. No. 1 W. & S. Life Ins. Co., B.B.B.&C. Sur. A-783. Drlg. 1,388 ft.
Oil Finance No. 1 J. S. Gambill. Drlg. 2,350 ft.
Regan & Davis No. 1 Williams, M.E.P.&P. Sur. A-927. Cem. surf. pipe and W.O.C.

Foard County

O. P. Burnham No. 1 Ward, sec. 21, H.& T.C. Sur., Blk. 8. Fsg. bit 1,000 ft.

Grayson County

North Texas Oil Co. No. 1 A. M. Smith, R. M. Williamson Sur. A-1300. S.D.O. 370 ft.

Jack County

Cockburn & Harper No. 1 Clayton. W. H. Smith Sur. A-540. Drlg. 3,040 ft.
F. S. Freeland No. 1 R. E. Graves, S. Hazel Sur. A-258. R.U.C.T.
H. M. Leidecker No. 1 J. W. Padgett, E. Allbritton Sur. A-1890. Drlg. 2,970 ft.; H.F. oil.
H. B. Madden No. 1 J. L. Mask, sec. 2708, T.E.&L. Sur. Drlg. 1,800 ft.
O J. Murray No. 1 W. J. Easterly, J. Helenstutter Sur. A-1269. Spdg.
Panhandle Ref. Co. No. 1 M. K. Graham, I. Hughson Sur. A-286. Drlg. 3,340 ft.
Tebay & Leberman No. 1 S. E. and E. W. Rankin, J. P. Thompson Sur. Spud and S.D.
R. A. Westbrook No. 1 Worthington-Knox, B.B.B.&C. Sur. A-185. Drlg. 1,475 ft.

Knox County

Denver P. & R. Co. No. 1 Waggoner, sec. 90, H.&T.C. Sur., Blk. E. Spdg.

Montague County

Benton & Holmes No. 4 Reed A, T. Robinson Sur. O.W.D.D.; B.O.S. 2,320-28 ft.; set 5-in. csg.; drlg. plug.
Moss Holmes No. 1 I. N. Monroe, F. Secrest Sur. A-665. Drlg. 2,175 ft.
Lesh & McCall No. 1 Dodson. T. R. Jackson Sur. A-394. Drlg. 1,983 ft.
J. W. Sorrell et al No. 1 J. E. Walthall, S. H. Smith Sur. A-662. Drlg. 1,381 ft.
Ventex Investments, Ltd., No. 1 S. E. Bell, sec. 11, M.E.P.&P. Sur. S.D.O. 3,300 ft.

Wichita County

Christie et al No. 1 Vanmeter, Blk. 35, K.W.V.F.L. Sur. 6⅝-in. 3,753 ft.; W.O.C.
Leo Oil Co. No. 1 Fonville, sec. 323, Waggoner Co. Sur. S.D.O. 1,950 ft.

Wilbarger County

King Oil Co. No. 1 Waggoner V, sec. 107, H.&T.C. Sur. U.R. 10-in. 1,600 ft.
F. A. Lain No. 1 J. Coffee, sec. 44, H.&T.C. Sur. Drlg. 4,786 ft.
L. Webb No. 1 Waggoner, sec. 49, H.&T. C. Sur., Blk. 2. L.S.O. 2,406-28 ft.; tested wtr.; S.D.O.; recmtg. csg.

Wise County

Latex Oil Co. No. 1 C. R. Smith, J. Couch Sur. A-104. S.D.O. 2,165 ft.; derrick pulled in.

Young County

F. W. Bennett No. 1 T. E. Mathews, I. Hughson Sur. A-2162. Drlg. 4,000 ft.
F. W. Bennett No. 1 R. V. Tidwell, J. L. Blackwood Sur. A-1378. Drlg. 1,500 ft.
Collins & Fitzwater No. 1 J. G. Castleman, sec. 72, T.E.&L. Sur. S.D.O. 1,002 ft.
H. J. Cox No. 1 W. T. Donnell, J. M. Smith Sur., sec. 1-7-1879. S.D. 1,800 ft.
Hickok et al No. 1 A. P. Martin, V. H. Twilliger Sur. A-1883. Spd.
C. A. Lupton et al No. 1 Hall, B. R. Aiken Sur. A-2241. T.D. 4,250 ft. S.D.O.
T. G. Shaw Oil Corp. No. 1 J. L. McLaren, sec. 6, B.B.B.&C. Sur. A-29. Drlg. 3,000 ft.
Yorktex Pet. Co. No. 1 W. E. Steele, I.R.R. Sur. A-156. Fsg. csg. 2,370 ft.
H. Zweifel No. 1 E. S. Graham, B.S.&F. Sur. A-44. Drlg. 800 ft.
H. Zweifel No. 1 R. D. Sewell, M. Case Sur. A-1402. Drlg. 2,200 ft.

RANGER (CENTRAL TEXAS) DISTRICT

Brown County

Charter O. & G. Co. No. 1 T. B. Slick, N edge of Grosvenor, 950 ft. from E and 450 ft. from S of W½ sec. 41, H.T.&B. Sur. Drlg. 500 ft.
Donald P. Kenyon No. 1 Stone, 2 mi. NW Brownwood, H. S. Thayer Sur. No. 206. Rig. up Ellenberger test.
West Texas O. & R. Co. No. 1 J. P. Newton, 3 mi. S Cross Cut, W. L. Swain Sur. No. 145. Moving in.

Callahan County

J. C. Jackson et al No. 1 Thompson, 2 mi. S. Eula, sec. 30, B.B.B.&C. Sur. Loc. for 2,000-ft. test.
Mesa Verde Oil Co. No. 1 Klepper, 4 mi. N of Clyde, sec. 69, B.B.B.&C. Sur. S.D. 1,600 ft.
R. F. St. John No. 1 M. M. Perkins, 3 mi. N Clyde, sec. 73, B.B.B.&C. Sur. Drlg. 1,325 ft.
B. A. Wilkinson, Trustee, No. 1 F. L. Martin, sec. 69, T.&P. Sur. Blk. 14. Drlg. 410 ft.

Coleman County

Dixie O.&G. Co. No. 1 Reaves, 6 mi. NW Bangs, 775 ft. from S and 2,228 ft. from W of J. M. Rhine Sur. No. 629. Loc.

Comanche County

N. D. Gallagher et al No. 1 Mrs. B. I. Terry, Desdemona pool, N. H. Kuykendall Sur. Fsg. bit 120 ft.

Eastland County

J. T. Anderson No. 1 Crist, 8 mi. N of Rising Star, sec. 36, Lavaca Co. Sch. Lds. T.D. 2,400 ft.; C.O.
Barnett Pet. Corp. No. 1 Downtain, 1½ mi. SE of Eastland, 1,000 ft. from E and 1,250 ft. from S of sec. 2, E.T.R.R. Sur., Blk. 6. R.U.
Barrett & Moon No. 1 Foote, 4 mi. NE Carbon, sec. 9, H.&T.C. Sur., Blk. 2. Spd. and S.D.
J. A. Bearman et al No. 1 Mrs. R. L. Poe, S edge Cisco, sec. 79, H.&T.C. Sur., Blk 4. Lake sd. 3,475-81 ft.; H.F.W.; drlg. 3,500 ft.
F. J. Estes No. 1 Gentry, A. Popejoy Sur. S.D. 3,000 ft.
L. A. Thompson No. 1 C. V. Fox, 4½ mi. S of Ranger, 1,434 ft. from N and 150 ft. from W of farm in Lot 28, McLennan Sur., Lge. 2. Loc.

Erath County

Jess Hickey et al No. 1 W. M. Martin, 2 mi. SE Desdemona, D. J. Otho Millard Sur. A-533. R.U.

Haskell County

Danciger O. & R., Inc., No. 1 Pardue, 8 mi. E Stamford, sec. 48, Thos. Toby Sur., Abst. 396. Drlg. 1,475 ft.
Forest Dev. Corp. No. 1 Pardue, 6 mi. NE Stamford, sec. 1, H.&T.C. Sur., Blk. 1. S.D. 1,642 ft.

Jones County

Art Cox No. 1 West, 10 mi. E Noodle Creek pool, Lot 72, Godwin Subd., Dewitt Co. Sch. Lds. Drk.
Fain & McGaha Oil Corp. No. 1 Eula G. Lucas, 5½ mi. NE Avoca, sec. 166, B.B.B.&C. Sur. Drlg. 1,275 ft.
Fain & McGaha Oil Corp. No. 1 J. H. Wheeler, 3 mi. NW Sandy Ridge pool, sec. 55, O.A.L. Sur. M.I.
G. M. Gillespie No. 1 W. H. McKeever, 4 mi. SE Anson, sec. 53, O.A.L. Sur. Sd. 2,171-75 ft.; good show fuel oil; U.R. 6-in.
Humble O. & R. Co. No. 1 Teaff Est., E S and W of NE¼ sec. 33, T.&P. Sur., Blk. 15. Drlg. 1,150 ft.
Moutray Oil Co. et al No. 1 G. M. Nugent, 3 mi. N of Hawley pool, sec. 23, T.&P. Sur., Blk. 15. Drlg. 1,150 ft.
Peckham et al No. 1 Denton Co. Natl. Bank, NE cor. county, sec. 17, H.&T.C. Sur., Blk. 3. Drlg. 1,800 ft.
Riddle et al No. 1 J. D. Freeman, 8 mi. SW Anson, sec. 6, T.&P. Sur., Blk. 17. Drlg. 2,150 ft.
S. B. Roberts Co. and Brown Eagle Oil Co. No. 1 W. L. Lewis, 1 mi. NE of Hawley, 660 ft. from N and 220 ft. from E of farm in M. Martinez Sur. No. 194. Spdg.

Palo Pinto County

Paul Garrett No. 1 Mabry heirs, NE cor. county, sec. 2,572, T.E.&L. Sur. Drlg. by bit 470 ft.
Henry Hobbs et al No. 1 Bessie Holt, 4 mi. S. Graford, sec. 1,783, T.E.&L. Sur. S.D. 200 ft.
Earnest Lloyd et al No. 1 Bailey, 3 mi. NE Graford, sec. 2,003, T.E.&L. Sur. S.D. 1,802 ft.

Runnels County

Hall Oil Co. Inc. & Jno. Caster No. 1 J. C. Beddo, 3 mi. N Ballinger, Blk. 51, D. Diaz Sur. M.I.M. for 3,600-ft. test

Shackelford County

Ben Banner No. 1 Dawson & Conway, 4 mi. NE Morris-Ruie pool, C NW¼ of SE¼ sec. 176, E.T.R.R. Sur. S.D. 1,100 ft.
Danciger O. & R. Co. No. 1 Davis & Walker, SW part of county, 220 ft. from N and W of S½ NE¼ sec. Loc.
Forest Dev. Co. No. 1 McKeever, NW cor. county, sec. 14, H.&T.C. Sur., Blk. 3. U.R. 6⅝-in. 1,875 ft.
Healy Drlg. Co. No. 1 L. J. Ackers, 5 mi. SE Bluff Creek pool, sec. 26, T.&P. Sur., Blk. 13. Drlg. 1,875 ft.
M. P. Moore et al No. 1 Geo. Gray, W side Bluff Creek pool, sec. 208, E.T.R.R. Sur. Drlg. 500 ft.
Ungren & Frazier No. 1 Snyder C, CSL of county, 3,216 ft. from E and 1,470 ft. from S of sec. 65, T.&P. Sur., Blk. 11. Loc.

Stephens County

Barnett Pet. Corp. No. 1 J. Q. Corbett, 4 mi. SE Ivan, 440 ft. due E NE cor. sec. 3, S.P.R.R. Sur., Blk. 3. R.U.
Clark & Cowden et al No. 2 Echols Heirs, 6 mi. SE Ivan, sec. 10, S.P.R.R. Sur., Blk. 3. Drlg. 1,260 ft.
Philtop O. & G. Co. No. 1 T. M. Corbett, 8 mi. NE Caddo, Edward Romershausen Sur., Abst. 149. 6⅝-in. 3,270 ft.; standardizing.

Stonewall County

General Crude Oil Co. No. 1 W. J. Bryan, 7 mi. N Hamlin, Subd. 10, Wm. Vardeman Sur. No. 347. Spdg.

Tarrant County

E. E. Hoffpauir et al No. 2 W. H. Davis, 2 mi. S Arlington, H. Blackwell Sur. S.D.O. 2,140 ft.

Taylor County

Felmont Corp. No. 1 Blackwell & Phillips, 5 mi. NE Abilene, 330 ft. from N and E lines, sec. 30, B.A.L. Sur. Drlg. 1,060 ft.
Hal Hughes et al No. 1 Manahan, 5 mi. S Abilene, sec. 14, L.A.L. Sur. Recmtg. 8-in.; drlg. 2,100 ft.

E. C. TEXAS WILDCATS

Anderson County

Barnsdall Oil Co. No. 1 H. C. Swanson, R. Duty Sur., 10 mi. E of Palestine. Top Pecan 3,314-3,630 ft.; drlg. 3,900 ft.
Tide Water Oil Co. et al No. 7 Monnig, S. Sanchez Sur., deep test, Long Lake field. Drlg. 9,975 ft.

Angelina County

Ed Holman et al No. 1 J. E. Hawkins Bradshaw Sur., S of Huntington. P.B. to 1,680 ft.; tstg.

Bowie County

Chew & Bassett No. 1 Barkman. Drlg. 1,422 ft.
Ferguson & Hill No. 1 Breckenridge. S.D. 2,701 ft.
Thompson & Jaffie No. 1 R. Rosalind, J. Milam Sur., 3 mi. SW of Redwater Reaming 6,008 ft.
Woodley & Bently No. 1 Lumpkin. Drlg. 3,821 ft.

Cherokee County

A. F. Richardson No. 1 F. P. O'Brien, G. S. Clapp Sur., 3 mi. NW of Rusk; 5,000-ft. test. Loc.
Stoco Oil Co. et al No. 1 E. B. Parks, J. T. Cook Sur., 4 mi. SW of Rusk. Top Austin 4,825 ft.; cg. 5,000 ft.

Ellis County

Gigantic Oil Co. No. 1 C. H. Sullivan, Wood Sur. Drk.

Falls County

H. H. Bell et al No. 1 A. Garrett, J. M. Sanches Sur. Set csg. 1,330 ft.
E. B. Collard et al No. 1 P. Neikamp, W. Hampton Sur., 3 mi. E of Lott. Drlg. 102 ft.

Fannin County

Joiner-Owens No. 1 Dr. Grey, Alex Russell Sur., 4½ mi. W of Monktown. W.O.C. 173 ft.

Freestone County

C. F. Lytle No. 1 R. Simmons, 23-ac. tr., R. B. Loughbotham Sur., 1 mi. S of Wortham. S.D. 3,820 ft.
T. E. Rossiter No. 1 J. P. Fulton in J. P. Fulton Sur., 4½ mi. E of Doney. Loc.
Stroude et al No. 1 P. Mullens, R. D. Sloan Sur., 6 mi. NE of Fairfield. T.D. 341 ft.

Gregg County

W. W. Bradley No. 1 Bivins, R. Williamson Sur., 16 mi. SE of Longview. Loc.

Henderson County

R. J. Paschal No. 1 H. M. Wilson, Thos. Caro Sur., 4½ mi. N of Malakoff. Loc.
Tide Water et al No. 1 McElreath & Suggett. Top Georgetown 4,990 ft.; top Paluxy 6,005 ft.; top Glenrose 6,270-80 ft.; S.D. 7,195 ft.; pipe cut 7,102 ft.; 9 bbls. oil per day.
Tide Water Assoc. et al No. 2-C McElreath & Suggett, W. P. Wyche Sur. Drlg. 150 ft.

Hill County

A. N. Mabry No. 1 J. T. Jones, 1 mi. S of Mt. Calm, Graves Sur. S.D. 754 ft.

Hopkins County

J. Carpenter Oil Co. No. 1 Gillis, between Brashear and Cumby, W. A. Smith Sur. S.D. 3,715 ft.

Houston County

American Liberty Oil Co. No. 1 W. L. Moody, S. E. Parker Sur., 1½ mi. NW of Grapeland. Drlg. 3,702 ft.

Hunt County

Stanolind O. & G. Co. No. 1 J. P. Hawks, R. Ragsdale Sur., near Campbell. Top Paluxy 4,383 ft.; top Glen Rose 4,815 ft.; top anhydrite 5,335 ft.; drlg. 5,353 ft.
Texola Land Corp. No. 1 J. M. Goin, Jas. Merrick Sur., 2 mi. SW of Wolfe City. S.D. 40 ft.

Lamar County

Blackman & McGee No. 1 J. M. Duck, J. C. Lamb Sur., just NE of Powderly. Loc.
A. W. Walker et al No. 1 R. L. Rose, A. T. Nowell Sur., 2 mi. N of Blossom. Loc.

Limestone County

A. W. Phillips et al No. 1 E. M. Speight, M. Herrin Sur., 6½ mi. SE of Mexia. S.D. 3,695 ft.
Pure Oil Co. No. 16-T Kendrick, P. Varella Sur., Mexia field. Top Georgetown 3,365 ft.; drlg. 4,000 ft.

Red River County

Roy I. Carter Drlg. Co. No. 1 J. A. Tutt, C 40-ac. tr. in D. Hart Sur., 2 mi. S of Avery. S.D. 410 ft.

Rusk County

Barnett Pet. Corp. No. 1 S. C. Sanford, W. A. Corder Sur., 10 mi. E of Mt. Enterprise. S.D. 50 ft.
J. Merrick et al No. 1 Tipps, T. Uzzell Sur. 6 mi. S of East Texas field. S.D. 110 ft.; W.O.C.
J. W. Shipman et al No. 1 Citizens Bank, J. J. Y'Barbo Sur., 4 mi. NE of Henderson. O.W.D.D.

Smith County

T. W. Doswell et al No. 1 J. Allred, B. Lafferty Sur., 3 mi. N of Troup. Drlg. 827 ft.

Van Zandt County

Glenn et al No. 1 E. Core, H. Ball Sur., 3 mi. N of Edom. Drk.
Humble O. & R. Co. No. 1 L. K. Riggs, W. Daniels Sur. Skidded 100 ft.; top Austin 2,805 ft.; drlg. 3,046 ft.

WEST TEXAS WILDCATS

Andrews County

W. G. Blanchard et al No. 1 Cox, C SW sec. 4, Blk. A-30, P.S.L. Sur. Drlg. 175 ft.
M. S. Forgeron et al No. 1 Lockhart & Brown, C NE¼ sec. 20, Blk. A-41, P.S.L. Sur. R.U.
Sinclair Prairie Oil Co. No. 1 Emma Cowden, sec. 11, Blk. 44, Twp. 2n, T.&P. Sur. Drlg. 3,636 ft.
G. F. Getty, Inc., No. 1 R. H. Lindley, sec. 8, Blk. A-46. T.D. 4,902 ft.; P.B. to 4,690 ft.; pumping oil and water; pumping off.
Hargrove et al No. 1 Riordan, NW¼, sec. 10, Blk. A-44, P.S.L. Sur. Drlg. T. D. 1,908 ft.; pipe stuck.
Humble O. & R. Co. No. 2 Walker, sec. 6, Blk. A-43, P.S.L. Sur. Drk.
Landreth Prod. Co. No. 1 L. Jones, sec. 11, Blk. A-42, P.S.L. Sur. W.O.C. 4,100 ft.

Bailey County

E. L. Wilson et al No. 1 Yellow House Land Co., Labour 4, Abner Taylor League 700. Elev. 3,687 ft.; drlg. 4,232 ft.

Brewster County

F. C. Dodson No. 1 Texas American Synd., sec. 66, Blk. 10, G.H.&S.A. Sur. S.D. 4,026 ft
Storey No. 1 Wilson, sec. 3, Blk. 212, T.& St.L. Sur. S.D. 2,175 ft.; C.O.

Cochran County

Bond & Harrison No. 1 Cameron, Labour 1, League 85, Greer Co. School Lands. Drlg. 4,662 ft.
Pete Wiggins et al No. 1 C. Slaughter Dean, C Lab. 26, League 92, Lipscomb Co. School Ld. Loc.

Coke County

H. E. Ogden et al No. 1 Rawlins. Drlg. 537 ft.
Plymouth Oil Co. No. 1 Mrs. Mary Hanna, sec. 252, Blk. LA, H.&T.C. Sur., 1½ mi. SW of Blackwell. S.D. 2,580 ft.

Crane County

Gulf Oil Corp. No. 2 McKnight, sec. 9, Blk. B21. Drlg. 5,178 ft.

Crockett County

R. H. Henderson No. 1 C. B. Haun et al. Machine.
Superior Oil Co. of Calif. No. 1 J. S. Todd, C SE¼ sec. 55, Blk. UV, G.C.&S.F. Sur. Drlg. 5,539 ft.

Dawson County

E. L. Wilson No. 1 Scanlon, Sec. 83, Blk. M, E.L.R.R. Sur. Loc.
E. L. Wilson et al No. 1 Texas Ld. & Mtg. Co., sec. 45, Blk. M, E.L.&R.R. Sur. W.O.C. 4,683 ft.

Edwards County

Dan Auld et al No. 1 Rigsby, sec. 16, Blk. OK, G.C.&S.F. Sur., 15 mi. NE of Rock Springs. W.O.C. 3,082 ft.
A. P. Carter No. 1 F. D. Sweeten, S&E sec. 48, Blk. 2, B&B Sur., 1½ mi. E of Rock Springs. Loc.

Ector County

Shasta Oil Co. No. 1 K. Sands, sec. 32, Blk. 44, T.&P. Sur. Loc.

El Paso County

Tri-State Oil Co. No. 1 Kinkel. S.D. 2,820 ft.

Fisher County

L. A. Daniels et al No. 1 J. J. Nickless. Drlg. 3,088 ft.
Martin & Brubaker No. 1 Brown W. F. Richardson Sur., sec. 4, Blk. R, T.P. 3,192 ft.; S.D. 3,194 ft. Acidized. 700 ft. oil in hole; retreated; testing.
Southern Oil Co. No. 1 Robinson, sec. 172, Blk. 2, H.&T.C. Sur., 2¼ mi. NE of Raton. T.D. 3,505 ft.; flowing 19 bbls. hour; gravity 40.7 deg.
Tide Water Associated Oil Co. No. 1 Joe Robinson, W½ NE¼ sec. 172, Blk. 2, H.&T.C. Sur. M.I.M.

Gaines County

Amerada Pet. Corp. No. 1 A. Faskin, sec. 160, Blk. G, W.T.R.R. Sur. Drlg. 2,200 ft.
A. G. Carter No. 1 A. L. Wasson et al, sec. 48, Blk. AX, P.S.L. Sur. Drlg. 4,575 ft.
A. G. Carter et al No. 1 Moore-Langdon, sec. 44, Blk. AX, P.S.L. Sur. Drlg. 1,806 ft.
Continental O. Co. No. 1 Jones, sec. 22, Blk. A-7, P.S.L. Sur. Drlg. 1,212 ft.
Continental O. Co. No. 1 Norton, sec. 46, Blk. AX, P.S.L. Sur. Loc.
T. N. Sloan et al No. 1 Barber, NE cor. sec. 19, Blk. A-28, P.S.L. Sur. T.D. 1,590 ft.; R.U.S.T.
Wentz Oil Co. No. 1 Dalmont, sec. 5, Blk. A-22, P.S.L. Sur. R.U.S.T. 4,501 ft.

Garza County

S. Caprito No. 1 Post Estate, sec. 230, Blk. 5, K. Aycock Sur. Drlg. 3,349 ft.

Glasscock County

Moore Bros. No. 1 King, 1,320 ft. from N and W, sec. 46, Blk. 36, Twp. 1s, T.&P. Sur. Loc.

Hockley County

R. F. Duggan et al No. 1 Yellow House

Land Co., cen. Labour 11, League 718. State Capitol Lds. Loc.

Howard County

Iron Mt. Oil Co. No. 1 D. H. Snyder, sec. 28, Blk. 30, Twp. 1s, T.&P. Sur. Cellar.
Shasta Oil Co. No. 1 Cora Echols, sec. 5, Blk. 15, T.&P. Sur. T.D. 2,880 ft.; swabbing.

Hudspeth County

Haymon Krupp Oil & Ld. Co. No. 1 Thaxton, SE¼ sec. 34, Blk. 74, Twp. 6. T.D. 3,040 ft.; reaming.

Loving County

Barnett Pet. Co. No. 1 Johnson, sec. 2, Blk. 57, Twp. 1, T.&P. Sur. R.U.S.T.
Barnett Pet. Corp. No. 2 W. D. Johnson, sec. 12, Blk. 56, Twp. 1, T.&P. Sur. Drk.
Finley et al No. 1 W. D. Johnson, sec. 24, Blk. 56, Twp. 1, T.&P. Sur. T.D. 2,806 ft.; R.U.S.T.
Stanolind O. & G. Co. No. 1 M. Kyle, sec. 20, Blk. 55, Twp. 1, T.&P. Sur. Top sd. 3,870 ft.; S.D. 3,964 ft.
Woodley Pet. Co. No. 1 Kloh, sec. 21, Blk. 55, Twp. 1, T.&P. Sur. M.I.M.

Mitchell County

Grisham-Hunter Corp. No. 1 Morrison, sec. 34-29-1n, T.&P. Sur. Machine.
Mitchell O. & G. Co. No. 1 Z. Morrison, sec. 36, Blk. 29, Twp. 1n, T.&P. Sur. T.P. 1,660 ft.; U.R. csg.

Pecos County

Cannon & Cannon No. 1 University, sec. 2, Blk. 20. Drlg. 701 ft.
Dobbs No. 1 University, sec. 30, Blk. 18. T.D. 725 ft.
Humble O. & R. Co. No. 1 E. M. Gray, sec. 94, Blk 11, G.H.&S.A. Sur.; 5,000-ft. test. Drlg. 4,424 ft.
K. Kimberlin No. 1 Humble-Young, sec. 49, Blk. 10, H.&G.N. Sur. T.D. 715 ft.; U.R. csg.
W. Y. Penn No. 1 Tinton, sec. 85, Blk. 8, H.&G.N. Sur. W.O.C. 100 ft.
G. J. Smith No. 1 W. E. Smith, sec. 37, Blk. 1, I.&G.N. Sur. R.U.S.T.
Tex-Mex Pet. Co. No. 1 Williams, sec. 79½, Blk. 8, H.&G.N. Sur. Drlg. 700 ft.
S. Thompson No. 1 Elsinore Cattle Co., sec. 54, Blk. D, G.C.&S.F. Sur. T.D. 4,910 ft.
Trans-Pecos Oil Co. No. 1 Gallagher, sec. 9-51-10, T.&P. Sur. S.D. 1,475 ft.
Trans-Pecos O. Co. No. 1 Popham. T.D. 535 ft. Set Csng.
Young No. 1 Perry, sec. 3, Blk. Z, T.C. R.R. Sur. Drlg. 1,341 ft.

Presidio County

L. C. Brite No. 4 fee, C NW¼ sec. 113, Blk. 12, G.H.&S.A. Sur. Drlg. 2,160 ft.
A. H. Main No. 1 Greenlee, sec. 40, Blk. 347, 13 mi. NE of Marfa. No report.

Reagan County

K. E. Sherman No. 1 W. E. Friend, SW cor. sec. 3, Wm. Allen Sur. Fsg. 695 ft.
Moore Bros. No. 1 University, sec. 8, Blk. 7. Loc.

Reeves County

Barnett Pet. Corp. No. 1 Ely, sec. 88, Blk. 71, P.S.L. Sur., 12 mi. NW of Toyah. S.D. 395 ft.
General Crude Oil Co. No. 1 T. P. Land Trust, C NE¼ sec. 15, Blk. 56, Twp. 2, T. & P. Loc.

Runnels County

K Z Oil Co. No. 1 B. Fletcher, E. C. Good Sur. S.D. 80 ft.
Price & Kramer No. 1 Giesecke, Blk. 227, Hughes Sur. Drlg. 2,368 ft.
Stevens & Glover No. 1 Fowler, sec. 150, E.T.R.R. Sur., 2 mi. NE of Ballinger. S.D. 415 ft.

Schleicher County

J. M. Cooper No. 2 B. Page, sec. 40, Blk. L, G.H.&S.A. Sur. T.D. 1,310 ft.; reaming.
Tex.Tor Oil Corp. No. 1 Judkins & Spencer, C of SW¼ sec. 33, Blk. A, A.&B. Sur. Drk.

Scurry County

Bristow & Cantrell No. 1 Tomlinson, sec. 122, Blk. 97, H.&T.C. Sur. Drlg. 2,800 ft.
E. L. Goos No. 1 Henderson, sec. 148, Blk. 97, H.&T.C. Sur. Fsg. 2,700 ft.
C. W. Guthrie et al No. 1 F. W. Hardee, sec. 99, Blk. 97, H.&T.C. Sur. M.I.M.

Terry County

Crump & Corrigan No. 1 Lewright, 660 ft. NE, sec. 1, Blk. C-37, P.S.L. Sur. T.D. 5,133 ft.; bridging back to set csg.
R. L. Foree No. 1 A. E. Pool, sec. 54, Blk. D-11, D.&S.E. Sur. Loc.

Upton County

John Ench No. 1 Lyon, sec. 8, Blk. 3½. Drlg. 1,745 ft.

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West Texas Fields

(Continued from Page 167)

feet, 50 bbls.; H. C. Moore, 2,959-90 feet, 50 bbls.; Corvette Oil Co. No. 5 Clayton, 2,983-3,110 feet, 10 bbls.; Deep Oil Development Co. No. 2 Bryson, 2,999-3,015 feet, 275 bbls.; Hamilton Petroleum Co. No. 6 A. B. Kuykendall, 2,950-3,252 feet, 3,500,000 feet gas. Hammon & Herbert Oil Co. No. 5 F. H. Rhodes, 2,304-35 feet, 125 bbls. T. D. Humphreys No. 2 Cooke A, 2,931-63 feet, 125 bbls. Kimberlin & Howse No. 4 Bryson, 3,170 feet, dry. John Korp No. 6 D. M. Rump, 525-33 feet, 10 bbls. H. S. Moss No. 1 J. M. Bloodworth, 3,575 feet, dry. Mullendore and others No. 2 Clayton, 2,983-3,046 feet, 135 bbls. The Trentman Co. No. 1 Miller, 3,200 feet, dry.

Wise County

Texas Canadian Oil Co. No. 1 W. D. Nimno, 3,503 feet, dry.

Wilbarger County

Humble Oil & Refining Co. No. 23 W. T. Waggoner H, 3,048-61 feet, 600 bbls. King Oil Co. No. 3 Waggoner P, 1,300 feet, dry. E. C. Lawson No. 2 W. T. Waggoner H, 1,885-1,905 feet, 35 bbls. Riner & Massie No. 19 Waggoner A, 3,380 feet, dry.

Phillips Petroleum Co. No. 6 W. T. Waggoner "OO," 2,611-18 feet, 75 bbls.

Young County

Golding & Cochran No. 1 R. T. Kerr, 1,200 feet, dry George E. Kesterson, Jr., No. 1 N. R. Finch, 785 feet, dry, Kimmell and others No. 5 Prideaux, 654-73 feet, 10 bbls. Nash & Windfohr No. 2 Manley, 3,317-27 feet, 130 bbls. Petroleum Production Co. No. 10 C. E. Luton, 657-66 feet, 3 bbls. Rathke Oil Co. No. 16 Graham, 904-08 feet, 30 bbls. E. C. Reed and others No. 1 George Brooks, 561 feet, dry.

Alexander and others No. 1 H. O. Prideaux, 574-78 feet, 10 bbls.; S. S. Alexander No. 9 G. B. Hamilton, 900-15 feet, 15 bbls. Cable Oil Co. No. 35 S. E. Snider, 581-88 feet, 10 bbls. G. C. Gilmore No. 1 J. W. Cox, 611 feet, dry. E. L. Hanson No. 2 J. O. Stratton, 505-12 feet, 10 bbls.; No. 3 J. O. Stratton, 515-22 feet, 5 bbls. Iron Mount Oil Co. No. 1 R. D. Webb, 853 feet, dry. Lupton & McLester No. 2 C. M. Gibson, 3,680-3,700 feet, 370 bbls. Pitzer & West No. 1 Mrs. F. Wray, 4,533 feet, dry. W. A. Quillen No. 1 Vance, 605 feet, dry. E. C. Reed and others No. 2 George Brooks, 575 feet, dry. Stuckey Oil & Gas Co. No. 1 J. W. Jones, 510-15 feet, 5 bbls.

Kentucky Fields

(Continued from Page 164)

hole full of water, total depth 1,517 feet. Clark & Snyder No. 4 E. Humphrey, drilling 875 feet.

Daviess County

Pellville district: O. D. Vickers and others No. 4 Eli Carder, 25 bbls. initially from Jett sand at 532-558 feet, total depth 558 feet. Rex-Pyramid Oil Co. No. 1 John Cooper, rigging up. Ohio Oil Co. No. 6 G. A. Weller, moving in.

Cane Run School district: Kentucky Producing Corp. No. 3 E. L. Omstott, dry hole, total depth 920 feet. Rex-Pyramid Oil Co. No. 8 S. Hinton N. Tract, drilling 600 feet. South-Penn Oil Co. No. 5 E. C. Ward, moving in.

Hewlett's Store district: Sunflower Oil & Gas Co. No. 1 Ollie Bean, drilling 500 feet.

Red Hill district: H. C. Davis and others No. 6 Herbert Salmon, drilling 550 feet. Globe Oil Co. No. 3 W. R. Russell, moving in. Hoosier Drilling Co. No. 1 Jim Yeiser, drilling 100 feet.

McLean County

Knobs district: Wickland Development Co. No. 2 Jake Conrad, rigging up.

Sacramento district: A. D. Noe and others No. 1 Eaves Barrett, drilling at 1,920 feet.

Cleopatra district: Hoosier Drilling Co. No. 1 J. T. Hayden, rigging up.

Webster County

Onton district: W. Sargent and others No. 1 J. E. Jenkins, drilling.

Hopkins County

Slaughters district: Imperial Oil & Gas Co. No. 1 Archibald Estate, drilling 2,500 feet.

EASTERN KENTUCKY

ASHLAND, Ky., May 31.—Four completions, all of meager flow, were reported in Eastern Kentucky this week with three of the four completed wells located in Estill County.

In Knott County, Inland Gas Corp. No. 1 E. A. Hammonds on the right fork of Troublesome Creek is in Salt sand at 1,302 feet. Inland No. 5 S. B. Webb on Jones Fork, near Lackey, is down 1,480 feet in Big lime. The same firm reports No. 2 R. C. Kilgore on Troublesome Creek, in slate at 360 feet.

Two operations are reported in Powell County with Wireman Brothers No. 3 Albert Stewart on South Fork at a depth of 500 feet. The South-Penn Oil Co. has one rig cleaning out old wells on the David Patrick farm in the same locality.

Ashland Oil & Refining Co. is moving in on No. 3 Joseph Wheeler, Andrew Skaggs and James Skaggs farms. This is a repressure job located on the corner of three adjoining farms on Wheeler Branch of Keaton in Lawrence County. In the Martha district of Lawrence County, Necessity Oil Co. has completed No. 1 Claude Wheeler at 1,400 feet, in Corniferous lime. There was a small showing of oil in the Weir and Berea formations, and after a shot the well made 1 bbl. a day.

Estill Completions

In the Wagersville district, Estill County, Claude Townsend No. 2 Dan Miller was completed at 380 feet with a flow of 5 bbls. a day. In the Fitchburg district the South-Penn Oil Co. No. 48 J. M. Garrett, on Cow Creek, was completed at 822 feet with a flow of 7 bbls. On the Sam Tipton land on Tickey Fork of Cow Creek, Petroleum Exploration No. 4 was completed at 310 feet with an oil flow of 2 bbls.

Louisiana-Arkansas Fields

(Continued from Page 154)

under way to drill this well deeper for a test of the Pettit lime and the Upper Travis Peak.

Producers Oil & Gas No. 5 Edwards, SW NW SW section 29-9-13, was a routine completion in the Converse field, pumping 75 bbls. daily, total depth 1,739 feet.

In the same field, Ray Drilling Co. No. 3 Burkett, NW SW section 10-9-13, pumped 55 bbls. daily, total depth 1,525 feet.

Webster Parish

After checking very low on all markers, and topping the anhydrite at 6,382 feet, W. H. Bass Drilling Co. has abandoned their No. 1 T. Crichton, section 21-20-9, at total depth of 6,420 feet.

In the Shongaloo gas area, N. V. Duncan No. 1 G. T. Baker, section 9-23-9, was found dry at total depth of 3,250 feet, and abandoned.

ARKANSAS

Clark County

Carter and Burdick No. 1 Ozan Lumber Co., NE NE NW section 25-9-19, found the Meakin and Nacatoch sands dry, and has been abandoned at total depth of 1,525 feet.

Nevada County

Bruce E. Wallace No. 2 W. Haynie, SE NE SW section 6-14-20, was a routine completion in the Troy field, pumping 10 bbls. daily, total depth 1,166 feet in Nacatoch sand.

Union County

The deepest and largest present producer in the state of Arkansas was completed at the close of the week in the newly discovered Schuler field, the second producer in the field, Marine Oil Co. No. 1 Marcus Justiss, SW of Lot 7, NW quarter section 18-18-17, flowed 940 bbls. in 13 hours on initial test, or 70.52 bbls. per hour, of 43 gravity oil, through 1½-inch tubing choke with casing pressure of 600 pounds and an estimated daily gas volume of 2,000,000 feet. After five hours, production showed 7 per cent drill water; after eight hours 2 per cent, and at the end of the initial test, production was clean pipe line oil. Hourly gauges during test were 92, 83, 71, 80, 68, 65, 69, 68, 67, 66, 65, 62 and 61 bbls.

Lion Oil Refining Co., which discovered the field by the completion of its No. 1 Edna Morgan in the same section a few weeks ago, has constructed a pipe line to its El Dorado refinery and is taking Marine's production, paying the posted price for oil in the El Dorado field of $1.22 per barrel.

Production is coming from a sand or sands in the lower section of the Travis Peak (Lower Trinity). After making Schlumberger electrical survey at a total depth of 5,660 feet, the 7-inch was set and cemented at 5,660 feet and well was selectively completed by perforating from 5,591 to 5,601 feet opposite most notable points of saturation.

The other two offsets to the discovery well were coring and testing about 100 feet above the producing level as the week closed.

EAST TEXAS (Border Counties)

Cass County

Reaching its contract depth of 6,505 feet without logging attractive shows, J. G. Puterbaugh (McAlester Fuel Oil Co.) has abandoned his No. 1 Doorley in the Calloway Davis Survey near Douglasville, and about 15 miles north of Rodessa production.

Shelby County

H. A. Stebbinger and others No. 2 Pickering Lumber Co., A. Hanson Survey in northern Shelby County, was completed last week as a gas-distillate producer from the Glen Rose, gauging about 20 bbls. of distillate and 10,000,000 feet of gas. This well was plugged back from 5,126 feet to 5,037 feet after encountering salt water at the lower level.

MARKET RECORD, ACTIVE OIL STOCKS

Compiled by Carl H. Pforzheimer & Co., 25 Broad Street, New York City, Member New York Stock Exchange and New York Curb Exchange

New York Stock Exchange

1937 High	1937 Low	Week ended May 29 Sales	High	Low	Close	Stocks—	Total shares outstanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1936	1936 High	1936 Low	1935 High	1935 Low
114⅞	90	900	97½	95½	95½	Amerada Corp.	788,675	N.P.	50cQ	1-30-37	$2.00	125½	75	80	48½
37	28	5,100	30¼	29⅛	29¾	Atlantic Refining	2,664,000	$25	25cQ	6-15-37	1.25	35⅛	26⅝	28	20½
43⅜	29⅝	1,900	32⅝	30¼	30⅜	Barber Co.	387,149	$10	25c.	6-1-37	.50	38½	21	22½	11⅝
35¼	24¼	7,900	27½	26⅜	26¾	Barnsdall Oil Co.	2,247,974	$5	25cQ	5-1-37	.80	28¼	14⅛	14⅜	5⅞
20⅞	11⅛	18,600	12⅝	11⅝	11⅜	Columbia Gas & Elec.	11,610,036	N.P.	20c	11-16-36	.40	23⅜	14	15¾	3⅜
17⅞	14½	28,800	15⅞	15¼	15⅞	Consolidated Oil Corp.	13,919,417	N.P.	20cQ	5-15-37	.80	17¼	11½	12¼	6½
47⅜	39¾	7,400	43⅞	43	43⅝	Continental Oil of Delaware	4,682,615	$5	50cQ†	6-30-37	1.50	44⅞	28⅛	35	15⅛
17⅝	12½	11,400	16	15⅛	15½	Houston Oil (new)	1,098,618	$25	....	10-17-30	....	13⅞	6⅜	7	1½
35⅜	27½	3,600	29⅜	28⅛	28½	Mid-Continent Petroleum	1,855,912	$10	50cSA	6-15-37	1.15	30⅞	17¼	20½	9½
34	25¼	1,900	28½	26¾	26¾	Mission Corporation	1,399,345	N.P.	....	.....	.45	29⅞	16¾	17⅜	10⅝
109⅞	62	1,000	103½	101½	103	National Supply of Delaware	382,591	$25	....	5-15-31	....	75½	19⅞	20⅞	9
22⅞	17⅛	11,100	20⅜	19⅛	19¾	Ohio Oil Co.	6,563,377	N.P.	50cSA	6-15-37	.60	18	12⅛	14¼	9¼
29¾	20⅜	300	23½	23½	23½	Pacific Western Oil	1,000,000	N.P.	65c	12-18-36	.65	23½	11¾	14	6⅜
4½	2⅜	1,100	3¼	3	3¼	Panhandle P. & R.	198,770	N.P.	....	.....	....	4¼	1⅜	1⅞	½
59¼	49½	12,800	57⅜	55¾	57¼	Phillips Petroleum	4,449,052	N.P.	75cQ†	6-1-37	2.50	52⅜	38⅛	40	13⅜
29⅞	24¼	3,400	27½	26½	26⅞	Plymouth Oil Co.	1,050,000	$5	35cQ†	3-31-37	.90	27¾	11⅞	13	6½
24⅜	17¼	62,100	19½	18½	19	Pure Oil Co.	3,281,120	N.P.	....	9-1-30	....	24⅞	16	17	5⅞
54¼	36⅝	1,900	42⅞	41¼	41¾	Seaboard Oil of Delaware	1,244,283	N.P.	25cQ	6-15-37	1.00	44	30½	36⅞	20⅜
34¾	25⅜	7,500	29⅞	29⅜	29¾	Shell Union Oil	13,070,625	N.P.	25c	12-15-36	.25	28¼	14¾	16½	5½
105⅜	102	500	104½	103⅛	104⅛	Shell Union Oil 5½% pfd.	343,500	$100	26⅛c	12-15-36	28.87½	127½	102	111	63⅛
4¼	3½	1,100	3⅝	3⅝	3⅝	Simms Petroleum	461,698	$10	50c liq.	1-9-37	2.25 liq.	6¾	3½	18¾	4¾
60⅝	42	1,600	58½	57	57½	Skelly Oil	1,006,348	$15	50c	7-1-37	....	47⅜	19½	20½	6½
20¼	16¼	42,600	19¼	18½	18⅞	Socony-Vacuum	31,151,071	$15	25cSA	3-15-37	.70	17½	12½	15⅝	10⅝
50	40⅝	7,700	44	42⅝	43½	Standard Oil of California	13,014,754	N.P.	45cQ†	6-15-37	1.20	47⅝	35	41⅛	27⅜
50	42	7,000	44¾	43⅞	43⅞	Standard Oil (Indiana)	15,196,241	$25	40cQ†	6-15-37	2.40	48½	32¾	33⅜	23
33⅜	30⅝	300	33⅜	32	33⅜	Standard Oil of Kansas	134,841	$10	$1	12-26-36	1.00	31	25	32	20
70	63⅛	13,900	67¾	66⅝	67¼	Standard Oil of New Jersey	25,856,081	$25	$1.25SA†	6-15-37	2.00	70⅜	51⅛	52⅜	35⅜
77½	65	900	65½	65	65	Sun Oil	2,156,825	N.P.	25cQ	6-15-37	$1 & 6% Sk.	91	70	77	60½
65⅛	50⅜	20,200	60⅛	58¾	59¼	Texas Corp.	10,896,858	$25	50cQ	7-1-37	1.50	55¼	28⅞	30¼	16½
9⅝	6¾	3,500	7⅝	7¼	7⅜	Texas Gulf Producing Co.	888,123	N.P.	5c	12-15-36	.05	8⅞	4⅜	4¾	2½
16⅝	11¾	16,600	15⅛	13¼	15	Texas Pacific Coal & Oil	888,237	$10	10c	6-1-37	.25	15¼	7½	9¼	3¼
21⅝	16⅝	9,300	18⅛	17⅜	17⅞	Tide Water Associated	6,288,512	N.P.	20cQ	6-1-37	.70	21¾	14¾	15⅞	7⅝
28¼	23¾	6,300	24⅝	24⅛	24¼	Union Oil of California	4,386,070	$25	30cQ	5-10-37	1.00	28½	20¾	24	14¾
31½	26½	500	28	27⅞	28	Union Tank Car Co.	1,200,000	N.P.	40cQ	6-1-37	1.20	31⅝	22⅝	26½	20⅞
6¼	4¼	2,200	5⅞	5¼	5⅝	Wilcox Oil & Gas	424,839	$5	....	5-10-28	....	5¼	2¾	3⅛	1

*Ex-dividend. †Includes extras.

New York Curb Exchange

1937 High	1937 Low	Week ended May 29 Sales	High	Low	Close	Stocks—	Total shares outstanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1936	1936 High	1936 Low	1935 High	1935 Low
21⅜	16	1,400	18¼	17⅝	17⅝	Bridgeport Machine Co.	260,000	N.P.	$1	12-21-36	$1.00	21	13¼	14⅛	3⅜
51½	46	100	49	49	49	Buckeye Pipe Line Co.	200,000	$50	$1Q	6-15-37	3.25	50	39¾	49	
2¾	1¾	5,500	1⅞	1¾	1⅞	Carib Syndicate	799,020	25c	....	.....	....	4⅞	1⅞	[illegible]	1⅝
123	110¼	500	118	118	118	Chesebrough Mfg. Co.	120,000	$25	$1.50Q†	6-28-37	7.00	124¾	105	157	115
5⅜	3	19,200	3⅝	3⅛	3⅛	Cities Service	37,804,394	N.P.	....	6-1-32	....	7⅜	3	3¼	⅝
4⅝	1¼	7,200	1⅞	1½	1⅝	Cosden Oil	399,687	$1	....	.....	....	4½	1½	1½	¼
38	28½	6,100	35⅜	34	34⅜	Creole Petroleum	6,974,356	$5	50cSA†	6-10-37	.50	39	19⅞	23¾	10
18⅝	12	700	13¼	12⅞	13	Darby Petroleum	351,390	$5	25cSA	7-15-37	.50	18⅛	9	8⅞	4
8¼	5¼	1,500	7⅛	6¾	6⅞	Derby Oil & Refining	263,162	N.P.	....	.....	....	6¾	1⅞	2	⅝
47½	36½	No sales	..	..	..	Eureka Pipe Line	50,000	$50	$1Q	5-1-37	4.00	47½	38½	38	33¼
63½	51⅝	7,400	57¼	55½	56¼	Gulf Oil Corp.	9,076,202	$25	25cQ	4-1-37	1.50, 100% Stk.	59	36	74¾	50⅛
87	75	1,400	79⅞	78	78⅝	Humble Oil & Refining	8,923,935	N.P.	37½cQ	7-1-37	1.50	80	57	64	44
24¼	20⅛	3,800	22	20⅞	20⅞	Imperial Oil of Canada	26,919,871	N.P.	62½cSA†‡	6-1-37	1.25	24½	19¾	22½	15⅝
15	7¾	100	11⅛	11⅛	11⅛	Indiana Pipe Line	300,000	$10	30cSA	5-15-37	.80	9¾	5½	6⅛	3⅝
39½	33¾	4,000	36¾	35	35	International Petroleum	14,247,088	N.P.	$1.25†‡	6-1-37	2.50	39⅝	32⅝	39¾	28
15¼	11⅜	5,100	12⅛	11⅝	12	Louisiana Land & Exp.	3,000,000	N.P.	10cQ	3-15-37	.50	15⅜	9⅞	11⅜	4⅜
26¾	16⅛	11,400	26¼	23⅞	26⅛	Lion Oil Refining	270,000	N.P.	25cQ	12-26-36	.75	17¾	7⅜	8⅛	3½
14¼	10⅜	1,800	11⅛	10⅞	11	Lone Star Gas	5,382,723	N.P.	20c	4-20-37	.60	14¼	9⅞	10⅞	4½
14⅝	10	800	10⅜	10	10	Midwest Oil Co.	998,444	$10	50c	6-15-37	....	..	..	..	..
7⅞	6	1,600	6⅜	6	6¼	Mountain Producers	1,682,182	$10	30cSA	6-15-37	.60	8⅜	5	5⅜	4⅛
19½	15¼	2,700	15⅜	15⅛	15⅛	National Fuel Gas	3,810,183	N.P.	25cQ	1-15-37	1.00	23	17⅜	20	11⅜
12½	10	400	12	11⅛	11⅛	National Transit	509,000	$12.50	45cSA	6-15-37	.75	15⅜	9¼	10⅝	6⅜
6⅛	4⅜	No sales	..	..	..	New Bradford Oil	1,445,202	$5	15cSA	4-15-37	.10	4⅝	2⅞	3¼	2
5	2⅝	1,200	2⅝	2⅝	2⅝	New Mexico and Arizona	1,000,000	$1	1c	12-1-36	.01	6⅝	1⅝	2½	1
5⅜	4½	No sales	..	..	..	New York Transit	100,000	$5	15cSA	10-15-36	.35	6¼	4¼	4⅞	3
12¾	7½	400	10¾	10¼	10¼	Northern Pipe Line	120,000	$10	40c	6-1-37	.40	9¾	4⅞	8	5¼
9⅝	5½	52,600	9	8	8½	Pantepec Oil	1,608,700	N.P.	....	.....	....	10⅛	3¼	4⅜	1¼
13¾	5¾	2,300	6⅛	5⅞	6	Root Petroleum Co.	336,045	$1	25c	11-2-36	.50	19¼	4½	5	1½
6½	4	300	5¾	5⅜	5⅜	Ryan Consolidated	296,931	N.P.	....	.....	....	4¾	1⅞	2½	⅝
48	42	500	44⅛	43½	44⅛	South Penn Oil	1,000,000	$25	75cQ†	6-30-37	2.60	44	32½	34½	21⅝
7¼	5	100	5⅜	5⅜	5⅜	Southern Pipe Line	100,000	$10	20cSA	3-1-37	.25	7⅞	3¼	5	3⅞
42	30	No sales	..	..	..	South West Penna. Pipe Lines	35,000	$50	50cQ	4-1-37	13.00	60	44	56	44¼
20¾	19	3,200	20¼	19⅜	19¾	Standard Oil of Kentucky	2,604,790	$10	40cQ†	6-15-37	1.35	23⅜	17⅛	24	18
13¾	11	No sales	..	..	..	Standard Oil of Nebraska	188,403	$25	25c	3-29-37	.25	14⅝	11	12	7⅝
45	33¼	500	37¾	37	37¾	Standard Oil of Ohio	753,740	$25	25cQ	3-15-37	2.00	40	21¾	23⅝	11½
4⅞	3¾	5,300	4⅜	4	4⅛	Sunray Oil	1,910,119	$1	5c	4-26-37	.10	5	2⅝	2⅞	⅞
7⅝	5⅝	700	5⅞	5⅝	5⅝	Texon Oil & Land	336,028	$2	15cQ	6-30-37	.60	9¾	5⅝	6⅞	5

*Ex-dividend. †Includes extras. ‡Payable in Canadian funds.

Note—In comparing highs and lows for the several years in the two tables, it will be necessary to take into consideration cases where there have been stock split-ups.

PERSONAL

B. I. GRAVES, vice president of the Tide Water Associated Oil Company, Associated Division, has been appointed chairman of the independent oil company finance committee in connection with the Golden Gate International Exposition of 1939, to be held in San Francisco. His job will be to supervise solicitation of support of independent oil companies. GEORGE D. GAVIN, assistant to the vice president of Associated, was appointed chairman of the service station equipment committee. Both men have started organization of their committees, and their plans for raising of funds contemplate thorough working of the fields allotted them.

WALTER B. PYRON, vice president of the Gulf Oil Corporation, Houston; W. M. WHELESS, land and geological department of the same company, and J. S. ABERCROMBIE, L. M. JOSEY and H. C. NELMS, independent oil operators, have jointly purchased a 5,000-acre ranch near Clodine, Tex.

DON DAWSON has been made general manager of General Petroleum Corporation's Washington division, with headquarters in Seattle, it is announced by A. H. DeFRIEST, vice president and ganeral manager. C. H. WARTMAN becomes general manager of the Southern California division; LLOYD BAYLY, advertising manager; J. A. McCLURE, manager of Pacific Coast stations; W. B. CURTIS, manager of Southern California stations; F. C. MEUNIER, sales manager of Oregon division; E. NEUBAUER, manager of Northern California stations.

FREDERICK E. KEY, vice president of the Key Company, East St. Louis, Ill., received the degree of doctor of mechanical engineering at the University of Tulsa Monday evening of this week. On Tuesday he was guest of honor at a dinner given by friends at the Oakhurst Country Club, Tulsa. The degree conferred on Mr. Key was in recognition of his research work in the oil refinery and steam plant fields. Equipment perfected by Mr. Key is said to be used in virtually every country in the world.

PROF. E. N. TERRES, of Germany, official of the Edeleanu Company, Ltd., and PAUL OBERGFELL, representing the company in the United States, left New York May 18 for a business trip to Chicago and Los Angeles before returning to Colorado Springs, Colo., for the annual mid-year meeting of the American Petroleum Institute. Mr. Oberfell was to present a paper at the meeting on "High Octane Number Blending Stocks Produced by Solvent Extraction." Professor Terres formerly was stationed in the United States as manager of Edeleanu activity and has been a frequent visitor to this country since he was recalled to headquarters in Germany.

HOWARD STUTCHBURY, of Edmonton, former trade commissioner of Alberta, has been elected assistant to the president of Abasand Oils, Ltd.

HARRY TEN BRINK, district chief clerk of Humble Oil & Refining Company, in charge of the Holliday, Tex., district office, has been transferred to the Wichita Falls division office. He was replaced by T. W. TARRANT.

A. G. LEVY, senior petroleum engineer with the Texas Company, Shreveport, La., and southwest district chairman of the production division, American Petroleum Institute, gave a talk before the East Texas chapter at its meeting last week in Kilgore.

A. L. DERBY, chairman of the board of the Derby Oil Company, Wichita, Kans., has returned from a month's vacation tour that included an ocean trip from New York, through the Panama Canal, to Los Angeles and San Francisco, Calif. He was accompanied by MRS. DERBY.

JAMES A. BUTTS, JR., formerly assistant engineer for the Texas Railroad Commission in Kilgore, Tex., has been promoted to division engineer, succeeding CHARLES LANGFORD, who recently was transferred to the Austin office of the commission as chief petroleum engineer.

J. I. RIDDLE, Humble Oil & Refining Company, has been appointed chief scout of the Texas Gulf Coast division. He succeeds JOHN V. VOYCE, who has resigned to join the Trinity Petroleum Company in Corpus Christi. Mr. Riddle will be assisted by D. P. OLCOTT, who will have charge of the statistical and evaluation work.

Do You Remember?

From The Oil and Gas Journal Files

25 YEARS AGO

The Texas Company is experimenting to develop the most suitable oil to be burned in smudge pots in South Texas citrus groves.

Interstate Commerce Commission declares that pipe line companies transporting oil between the states are common carriers and orders 13 companies to file rate schedules.

A wildcat gas well near Duncan, Okla., causes an exodus of oil men from Electra and Wichita Falls, Tex., to get in on the play.

20 YEARS AGO

Trapshooters Oil Company, made up of a group of clay pigeon marksmen from Butler and Sedgwick counties, Kansas, opens the Towanda pool a little west of Eldorado, with a 20,000-bbl. well in section 11-26-4.

An Osage County tract of 160 acres brings $200,000 at an auction sale at Pawhuska, Okla. It was the southwest quarter of section 10-23-8 and was purchased jointly by Sinclair, Gulf and Osage-Hominy Oil companies.

Howard L. Scrafford, vice president and a director of Eureka Pipe Line Company, dies in Pittsburgh, Pa.

10 YEARS AGO

An 1,800-bbl. well links the Church-Fields and Gulf-McElroy pools in West Texas.

W. L. Jeffords, veteran oil producer, dies in Nowata, Okla. He was noted for his success in getting results from stripper wells.

A. Mowinckel of Genoa, Italy, and H. Reideman of Berlin, Germany, have been added to the board of directors of the Standard Oil Company of New Jersey. They are the first resident Europeans to have been given places on the board.

J. DILOT, advertising manager of the A. O. Smith Corporation, has left on a two months' trip to Sweden, during which he will attend a celebration in honor of his parents.

J. M. KOCH, Oil City, Pa., vice president and sales manager of the Quaker State Oil Refining Company, has been chosen a director. Other directors and the officers were reelected.

ROLLIN ELLIS, formerly a member of the geological department of The Texas Company in California, has joined the Richfield Oil Corporation as district geologist for the San Joaquin division.

CLAUDE L. SLICKER, veteran Venango County oil producer, made the first hole-in-one of the season at the Wanango-Country Club, Oil City, Pa., when he sank his tee shot on the 160-yard No. 10 hole.

J. EDGAR PEW, Philadelphia, Pa., vice president of the Sun Oil Company, in charge of production, went to Dallas, Tex., on business and to attend the company's yearly picnic, held at Glen Lakes Country Club May 27.

J. E. BAILEY, formerly chief petroleum engineer for the Texas Railroad Commission, with headquarters in Austin, has resigned to become district engineer in the East Texas field for the Tide Water Associated Oil Company.

LON E. JACOBSON, for three years Mid-Continent representative for H. K. Stahl, St. Paul, Minn., has been made general manager of the company, and left for that city last Saturday to assume his new position. His headquarters had been in Tulsa.

PARAGRAPHS

E. B. FISH, W. C. SHELTON, EDWARD GROSS, WILLIAM B. OGDEN and CHARLES M. HUTCHINSON, of Los Angeles, and J. A. McDERMOTT, CHARLES D. DEYO, FRANK S. BEEBEE, EDWARD W. WEAVER, PETER G. BRUDER and ARTHUR S. KLEEMAN, of New York, were elected directors of the Los Angeles-New Mexico Oil Company. Mr. Kleeman, Mr. Fish and Mr. Beebee were elected president, vice president and secretary, respectively.

F. M. ANDERSON and E. E. McWHIRTER, drillers for the California Western Oil Company, Los Angeles, are preparing to leave for Alaska to continue work on the Iniskin Drilling Company's wildcat on Chinitna Bay. Accompanying them will be drilling crews composed of JOHN WOODMAN, J. W. ALLEN, J. ALLEN, SIG BENSON, M. E. MILLER, FRED MUNSEN, J. B. HAVENSTRITE, W. G. AHRENS, all of California Western Oil Company. In Alaska they will join HOMER HAVENSTRITE, drilling superintendent; DR. ALBERT MILLER; MARCELL STIRM, radio operator; H. K. WYRICK, C. M. SWANSON and W. H. O'DELL. CARL BEAL and DWIGHT WHITING, of the drilling company, have already left.

COL. W. C. O'FERRALL has resigned as production manager of the Lion Oil Refining Company of El Dorado, Ark., effective July 1. He joined the organization in 1936 after having been with the Standard Oil Company of Louisiana many years. His plans have not been announced. JOHN E. HOWELL, affiliated with the Empire Oil & Refining Company, Bartlesville, Okla., is to succeed him.

FOREST R. LOWREY has resigned as president of the Pure Oil Products Company to devote his entire time to the American Mineral Spirits Company, of which he has been vice president and treasurer for 12 years. Mr. Lowrey had been associated with the Pure Oil Products Company since its organization in 1931 by the Pure Oil Company and the Keystone Oil & Manufacturing Company. STEWART E. NIELSEN will succeed Mr. Lowrey as president of the Pure Oil Products Company.

JOHN A. BROWN, president of the Socony-Vacuum Oil Company, Inc., commenting on business conditions at the annual meeting of stockholders in New York last week, said the oil industry, in common with other lines of trade, must expect to feel the effects of ascending costs, caused by wage increases and higher prices for material. This matter of mounting cost of operation, he pointed out, made it difficult to predict with assurance the extent to which improvement recorded by the oil business in the first quarter of 1937 could be carried through the rest of the year. Like most other oil companies, Mr. Brown said, Socony-Vacuum had made substantial gains.

W. E. LANG, Lexington, Ky., oil operator, is in Tulsa on a business mission.

J. K. KEPLEY, independent oil operator of Laredo and Corpus Christi, Tex., has purchased an airplane to use in his business in Southwest Texas.

C. M. CREBBS, president of the Mene Grande Oil Company, Venezuela operating concern owned by the Gulf Oil Corporation, is in New York on a business and vacation trip.

R. A. MILLER, superintendent of the Magnolia Petroleum Company's Union County, Arkansas, district, now has charge of the Lisbon field, in northern Louisiana, also, his territory having been extended.

WALTER S. HALLANAN, president of the Plymouth Oil Company, said he expected a 12 to 15 per cent increase in demand for petroleum products in 1937. The statement was made at the company's annual meeting in Pittsburgh, Pa.

W. J. LOFTUS, of the legal department of the Phillips Petroleum Company, has been transferred from Amarillo to Austin, Tex., where the company has opened a legal and engineering division. WILLIAM P. MOORE will be in charge of the new engineering office.

JOHN R. SUMAN, vice president in charge of production for the Humble Oil & Refining Company, and JOE McMILLAN, head of the geological department of the Adams Louisiana Company, both of Houston, Tex., after bear hunting in the mountains near Cody, Wyo., were to attend the A.P.I. meeting in Colorado Springs, Colo., this week.

He Didn't "Have It Soft"

Although Lynn G. Smith, recently elected president of the Bradford District Pennsylvania Oil Producers Association, entered the oil business with his father, it is not to be assumed he "had it soft." On the contrary, he started by buying from his father, L. H. Smith, one of the Bradford field's pioneer operators, an interest in one of the older man's wells. The purchase was made on a strictly business basis. However, young Lynn's share in this one producer was profitable, forming the nucleus of important acreage acquired later in the Bradford field.

LYNN G. SMITH

Lynn G. Smith, who is treasurer of the Smith Oil Corporation, was a director of the old Northwestern Oil Producers Association and he took an active part in the reorganization of that body into the Bradford District Pennsylvania Oil Producers Association. He has served as a director of the present association since it was formed, and for two years he had been vice president.

Oil producers in the Bradford field, who have come into new prominence in late years through originating and developing a system of water-flood recovery of oil, have been pioneers in many production methods, and Mr. Smith is typical of the group. At the present time the company of which he is treasurer is devoting time and experimentation to the development of a more efficient water treater.

P. E. NOLAN, chief geologist for the Mene Grande Oil Company at Maracaibo, Venezuela, arrived in New York this week for a vacation.

HARVEY H. BLAIR, independent oil producer and member of the firm of Hartman & Blair, has returned to his home in Wichita, Kans., after spending the winter in Florida.

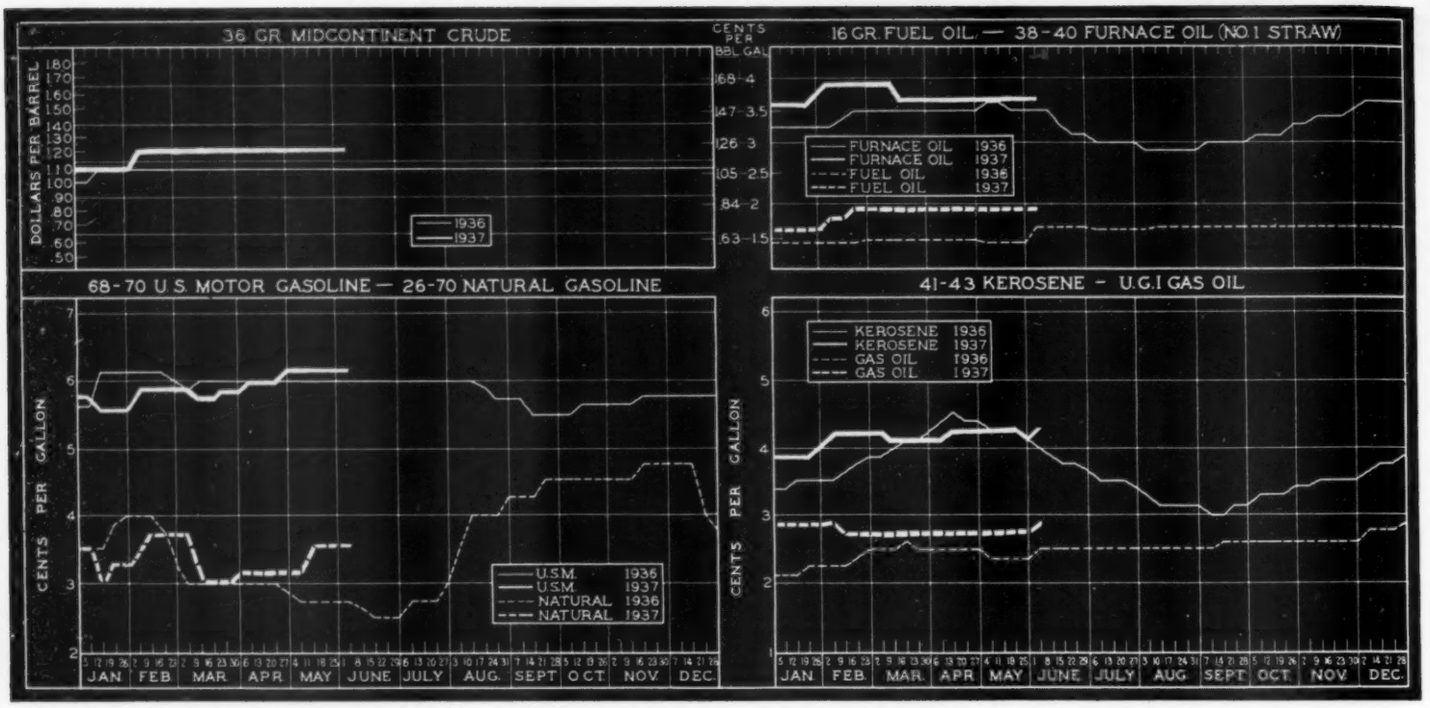
CLARENCE MARSHALL CHASE, JR., weight 8 pounds, arrived recently at the home of his parents in San Angelo, Tex. His father is a scout for the Sun Oil Company in the West Texas district.

DR. A. W. GAUGER, director of the School of Mineral Industries, Pennsylvania State College, spoke on production of liquid fuels by hydrogenation of bituminous coal at the American Mining Congress in Cincinnati.

E. J. HENRY, vice president of the Atlantic Refining Company, with headquarters in Philadelphia, made a tour of inspection along the Gulf Coast the past week. In the course of it he visited the company's new refinery near Beaumont, Tex.

W. C. WHALEY, vice president of the Barnsdall Oil Company of California, and E. WAYNE GALLIHER, chief geologist, completing a tour of Barnsdall properties in the Mid-Continent and on the Gulf Coast, returned to Los Angeles last Friday.

M. J. DELANEY, of National Drilling Contractors Association, presided Monday of this week at a meeting in Dallas, Tex., of contractors from Texas, Louisiana, Arkansas and New Mexico. The call was made to perfect ways and means of improving the contracting business in the region.



Representative Mid-Continent Quotations on Crude Oil and Refined Products, Basis Oklahoma (Group 3)

Triple Holiday Sets Gasoline Market Off to Flying Start in Group 3

By T. F. SMILEY

The three-day holiday drew heavily on gasoline stocks in the Group 3 area, setting the market off to what is expected to be a record season in point of gallonage. A parade of jobber orders preceded the expanded weekend, which was followed by further calls for material to replace what had been used by motorists who crowded the highways Saturday, Sunday and Monday.

"We're over the hump," was an expression used by sales managers, some of whom had begun to feel a little disquiet over the slow rate at which gasoline was getting into its summer stride. Spot orders in various instances had to be refused in order to take care of contract customers. East Texas was reported cleaned out. Any refiner in that district who had third-grade gasoline eligible for federal tenders could get 5¼ cents for immediate shipment. A dozen plants were operating.

Higher Prices Seen

Higher refinery prices for gasoline are declared to be imperative. One East Texas refiner who has a complete plant was quoted as saying that since the recent 8-cent advance in the price of crude in that district he loses 10 cents on every barrel processed. He is getting 81 cents a barrel for heavy fuel oil going to railroads, but the prices received for some of the other products, he asserted, do not cover cost of manufacture.

Concern was expressed this week over irregularities in the gasoline tank-wagon and retail markets. Price-cutting, which had been going on at scattered northern points in Standard of Indiana territory, was appearing in Oklahoma, Kansas and Missouri. Dealers, with a view to increasing their gallonage and perhaps adding names to their lists of permanent customers, have been giving rebates to owners of truck fleets and other large buyers, secretly at first, but now quite openly. Three-cent rebates on house-brand motor fuel are said to have become fairly common, and a few dealers are reported to have given 4 cents, thus cutting their own profit margin to 1 cent. Some oil companies, under the stress of relentless competition, are reported to have cut tank-wagon prices. It was hoped the lively summer demand now in sight would remedy this unhealthy condition, which exerts a depressing influence on the tankcar market.

Natural gasoline, still ignoring seasonal precedents, exhibited a better tone than last week, and belief was widening that it had seen its low for the year. Substantial buying for export and coastwise shipment cleaned up stocks so thoroughly a month ago that quotations jumped a quarter-cent. This extra business, coming at a time of the year when the naturals ordinarily are headed downhill, was looked upon as just a windfall, a fleeting bit of luck, and it was asserted another week or two would see prices drop to their previous level.

But although July commitments for Gulf ports are not as heavy as they were for May and June and although the demand this week was not so insistent as that of mid-May, it was agreed in the trade that the market was of a sturdier character.

Kerosene Tightening

Kerosene, which had shown signs of softness in spots, was tightening, and the 41-43 grade was reported especially strong at 4¼ to 4⅜ cents, with a bit of difficulty in finding available supplies. Tractor fuels were moving briskly.

Some of the buoyancy exhibited by fuel oils on both the Atlantic and the Pacific coasts is beginning to be felt in a mild form in the Mid-Continent territory. Notwithstanding the fact that domestic consumption of furnace distillates has fallen almost to zero, the prices which prevailed last March are still holding. Jobbers are inquiring for fall supplies. Heavy fuel oil was in steady demand. Increased vigor was reported in U. G. I. gas oil, with quotations stiffening.

Refined Oil Market Barometer

The three-day suspension of business imparted fresh impetus to gasoline sales, and active jobber demand was indicated this week to replenish stocks. Refiners generally foresee increasingly lively business as 1937 touring season develops. Natural gasoline settling into sounder position. Fuel oils firm, with likelihood of higher prices impelling buyers to store for fall requirements.

MID-CONTINENT. Tankcar gasoline tightening, but retail market suffering from price-cutting.

EAST COAST. Gasoline strong. Kerosene stronger. Fuel oils firm, with higher prices indicated.

GULF COAST. Kerosene stronger. Gasoline and fuel oils firm.

CALIFORNIA. General market steady, with gasoline firmer.

PENNSYLVANIA. Gasoline up. Kerosene and fuel oil movement improved. Lubricants holding.

CHICAGO. Gasoline and kerosene stronger. Tractor fuels in demand. Heavy fuels steadier.

Gasoline and Fuel Oil Are Headed for Higher Ground in East Coast Area

By H. STANLEY NORMAN

NEW YORK, June 1.—The heaviest week-end travel so far this summer registered over the 72-hour Memorial Day period bolstered a previously strong gasoline market in the northeastern section of the country and all grades of motor fuel appeared definitely headed toward higher ground. All modes of transportation, most of which in addition to private passenger cars are dependent on petroleum products, were taxed to capacity for the three holidays. Airlines, motor bus lines, steam and motor ships, railroads and municipal transportation facilities all reported record reservations in cases where advance space accommodations are necessary. Although complete records are not yet available, tool bridges and tunnels leading to and from New York probably handled an all-time Memorial Day volume of traffic.

Numerous suppliers of motor fuel in New York, New Jersey and Pennsylvania reported their delivery facilities were taxed to meet the demand from service station outlets, although the maximum advance preparation for heavy holiday travel was made during the last week of May.

The indicated record travel on Memorial Day week-end coupled with steady high movement of motor fuel into consuming channels throughout May probably will be followed by further strengthening of the market in this section of the country. Evidence that the market is in position to advance was given during the middle of last week when most suppliers in New Jersey advanced motor fuel a half cent per gallon in tankcar and tank-wagon quotations. The New Jersey advance was made on May 27 by most of the large suppliers, but the higher market in that state was largely an equilization movement bringing it up to a level with New York and Pennsylvania prices. New Jersey has been the outstanding low-pressure spot in the eastern gasoline market for several weeks. The advance on May 27 proved timely in that it was launched in sufficient time to cover most of the inflated Memorial Day traffic.

With Memorial Day the real swing into heavy summer gasoline consumption normally starts. However, consumption has been running approximately 10 per cent above 1936 through the first five months of the current year and refiners generally anticipate that this margin of increase will be maintained quite uniformly throughout the summer. On the basis of heavier volume for June, July and August, however, the next 90 days will prove the real testing ground for 1937 consumption.

Condition of the Gulf Coast market, the sound position of motor fuel stocks along the North Atlantic seaboard and continued strength in the fuel oil bracket are marketwise factors which are pointing with increasing clarity toward 1937 as a potential record year for the petroleum industry. Gulf Coast suppliers are currently quoting 6.5 cents per gallon for 65 octane motor fuel under hatch. The coastwise tanker market is showing no slump similar to that which has appeared during the past three weeks in boats of foreign registry. Two clean tankers were reported engaged last week for coastwise trips involving consideration of 51 cents per barrel. Considering that the vessels are intended for movement of high octane gasoline, the coast on entering New York harbor is 7.69 cents per gallon. The calculation does not allow for over the dock charges on the discharge end of the haul. In the export market, Rumanian gasoline is again becoming a factor in competition with Gulf Coast production. Motor fuel of 64-66, 375 e.p. specification is currently available in Rumania at approximately 6 to 6.125 cents per gallon, Gulf Coast basis. Export inquiries have dropped to a recent low on the Gulf Coast, but restrictions incurred have been more than compensated by increasing demand from North Atlantic customers.

Kerosene is showing greater strength currently on the Gulf Coast than reported for several weeks. Offers of 4.50 to 4.75 cents per gallon are required to attract suppliers, it is reported. A few suppliers were said to be quoting 5 cents per gallon on kerosene at the Gulf, but limited quantities are still available at the lower figures. Improvement in the market on the Gulf Coast, reflected on the eastern seaboard in kerosene was also reported from the Pennsylvania district. Refiners in Pennsylvania and on the Atlantic Coast, however, reported an increasing tendency on the part of farmers to use U. S. Motor gasoline in their tractors, at least in sufficient quantities to curb the normal seasonal call for kerosene. Gasoline movement from Pennsylvania is reported brisk, particularly against contracts. Shipping instructions placed against contracts are sufficient to carry the open market business for the time. However, open market calls are somewhat limited in the Pennsylvania district.

With trends fairly definitely established with relation to motor fuel, the chief trade interest now centers around fuel oil. Current deliveries are being made at or near the prices existing at the end of winter, but the new contracts for next fall and winter delivery are expected to be issued within the next two weeks. Light domestic fuel oil contracts are expected to be written on the basis of 7.5 to 8.5 cents per gallon, a cent to 2 cents over the price applying to a majority of North Atlantic coastal deliveries last fall, winter and spring. Jobbers last week made a last minute effort to induce their regular customers to load their tanks before June 1, stating that prices will be advanced materially.

So far none of the large companies have disclosed their contract prices, but will not deny that higher fuel oil quotations are in prospect.

Involved in the fuel oil situation is the continued rapid increase in distillate and industrial burners, which in several parts of the country is keeping well ahead of new building. The obvious indication is that fuel oil is making further inroads on other types of heating materials.

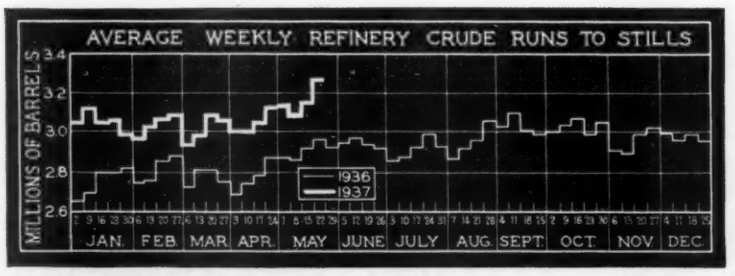
Industrial fuels remain definitely on the strong side of the market, despite recent advances in certain grades of the heavy material. Bunker C fuel oil is reported moving briskly at prices ranging from $1.35 to $1.50 per barrel. Steamship lines are enjoying one of their best early summer seasons in years and the more popular boats are booked ahead to capacity for duration of the summer. Bunker C fuel oil on the Gulf Coast is reported scarce at prices ranging from 0.925 to 0.95 cents per barrel in cargo quantities for coastwise shipment. Consequently, the material available on the open market in Baltimore, Philadephia, New York and Boston at $1.35 is limited. Some companies are restricting deliveries at $1.35 to their contract customers.

Inter-refinery purchases of fuel oil is continuing quietly, particularly by concerns whose stocks were drained down to the danger

(Continued on Page 186)

A. P. I. Weekly Refinery Statistics

Refinery figures for the week ending May 29 not available due to Memorial Day holiday



Stocks of Crude Oil in the United States

(BUREAU OF MINES ESTIMATES)

Week ending May 15, 1937	305,365,000 barrels
Week ending May 8, 1937	304,148,000 barrels
Week ending May 16, 1936	315,275,000 barrels

RETAIL OIL MARKETS

Tank-wagon and filling station prices on gasoline and kerosene furnished by the larger marketing firms

Prices as of June 1, 1937

Taxes

The gasoline quotations given in the following tables include the 1-cent federal tax, as well as state, county and city taxes. The gasoline is the regular or standard grade. In most areas a third grade and a premium grade are also available.

Standard Oil Co. (Indiana)

	Gasoline Tank wag.	Dlr.	Inc. tax	Kero. tank-wag.
Chicago, Ill.	16.0	14.0	4.0	10.1
Decatur	16.0	14.5	4.0	10.1
Joliet	16.0	14.5	4.0	10.1
Peoria	16.0	14.5	4.0	10.1
Quincy	15.8	14.3	4.0	9.9
Davenport, Ia.	16.0	14.5	4.0	‡13.1
Des Moines	15.8	14.3	4.0	‡12.9
Mason City	16.2	14.7	4.0	‡10.3
Sioux City	16.0	14.5	4.0	‡13.1
Duluth, Minn.	17.8	16.3	5.0	10.9
Mankato	17.4	15.9	5.0	10.5
Twin Cities	17.4	15.9	5.0	10.5
Lacrosse, Wis.	17.4	15.9	5.0	10.5
Green Bay	17.7	16.2	5.0	8.6
Milwaukee	17.3	15.8	5.0	10.4
Detroit, Mich.	15.4	13.9	4.0	9.8
Grand Rapids	16.5	15.0	4.0	10.9
Saginaw	16.3	14.8	4.0	8.5
Evansville, Ind.	17.5	16.0	5.0	†10.6
Indianapolis	17.7	16.2	5.0	†9.6
South Bend	17.9	16.4	5.0	†9.6
Fargo, N. Dak.	17.4	15.9	4.0	11.5
Minot	18.6	17.1	4.0	12.7
Huron, S. Dak.	17.8	16.3	5.0	10.9
Kans. City, Mo.*	15.4	13.9	4.0	8.9
St. Louis*	15.7	14.2	4.0	9.8
St. Joseph*	15.4	11.4	4.0	6.9
Wichita, Kans.	14.9	13.4	4.0	8.9

*State tax 2 cents, 1-cent city tax and 1-cent federal tax. †Does not include 4-cent state tax. ‡Iowa kerosene prices include 3-cent state tax.

(Exclusive of state general sales taxes, except Indiana and South Dakota.)

Discounts to commercial consumers: On purchases per month off tank-wagon prices: 1,000 gallons or more, 1.5 cents off; minimum delivery 25 gallons.

Stanolex Fuel Oil in Chicago

Effective Dec. 7, 1936, f.o.b. Chicago tank-wagon prices: Range oil, 1-99 gallons, 8.8 cents; 100-149 gallons, 7.8 cents; 150 gallons and over, 7.3 cents. Stanolex No. 1, 1-99 gallons, 8.8 cents; 100-149 gallons, 7.8 cents; 150 gallons and over, 7.0 cents. Stanolex furnace oil, 1-149 gallons, 7.8 cents; 150 gallons and over, 7.0 cents. Stanolex A, 1-399 gallons, 5.75 cents; 400 gallons and over, 4.75 cents. Stanolex B, 1-799 gallons, 5.75 cents; 800 gallons and over, 4.75 cents.

Atlantic Coast District

STANDARD OIL CO. OF NEW JERSEY

	Gasoline Tank wag. dlr.	Tank car con'r.	Inc. tax	Kero. tank-wag.
Atl'tic City, N. J.	13 0	11 5	4 0	8 0
Newark	13 0	11 5	4 0	8 0
Annapolis, Md.	15 1	13 6	5.0	10.0
Baltimore	14 5	13 0	5.0	8 5
Cumberland	16 9	14 4	5 0	10 0
Wash'g'n, D. C.*	12 5	11 0	3.0	9 0
Danville, Va.	17 7	15 2	6 0	12.9
Norfolk	16 5	14 0	6 0	11 5
Petersburg	16 8	14.3	6.0	11 7
Richmond	16 8	14 3	6 0	11 7
Roanoke	18 0	15 5	6 0	12 9
Charles'n, W. V.	16 3	13 8	6 0	12 6
Parkersburg	15 6	13 1	6 0	11 2
Wheeling	15 5	14 0	6 0	12 2
Charlotte, N. C.	18 9	16 4	7 0	13 6
Hickory	19 4	16 9	7 0	13 0
Mt. Airy	19 2	16 7	7 0	12 8
Raleigh	18.5	16 0	7 0	12 1
Salisbury	19 0	16 5	7 0	12 7
Charleston, S. C.	17 5	15 0	7 0	11.1
Columbia	18 5	16 0	7 0	12 1
Spartanburg	19 2	16 7	7 0	12 9

*Standard of N. J. has discontinued posting service-station prices at all above points except at Washington where a station price of 16 cents is in effect.

Price basis to commercial consumers, effective March 8, 1937, in Maryland, District of Columbia, and in Arlington and Fairfax counties in Virginia; and March 12 in New Jersey: To contract accounts purchasing at least one full compartment at time by hose connection, on yearly purchases: From 2,500 to 100,000 gallons, consumer tank-wagon price at time and place of delivery; 100,000 gallons per year, consumer tankcar price plus .5 cent per gallon. Consumer tank-wagon price generally will be equivalent to dealer tank-wagon price less .5 cent per gallon.

Effective May 15, 1937, in North and South Carolina, West Virginia and Virginia (except Arlington and Fairfax counties): Commercial consumers taking deliveries of 50 gallons (W. Va., 100 gallons) or more at one time will be billed at posted consumer tank-wagon price. Accounts taking deliveries of less than 50 gallons (W. Va., 100 gallons) will be billed at 4 cents per gallon over posted consumer tank-wagon price. Generally the posted consumer tank-wagon price will be equivalent to the dealer price less .5 cent per gallon.

Discount for kerosene, 1 cent off tank-wagon price for 25 gallons or more under contract (contract not necessary in Baltimore) except no discount in New Jersey.

Southern District

STANDARD OIL CO. OF KENTUCKY

	Gasoline Tank wag.	Net dlr.	Inc. tax	Kero. tank-wag.
Atlanta, Ga.	21 0	18 0	7 0	*13 0
Augusta	19 5	16 5	7.0	*14.0
Macon	21 5	18 5	7.0	*14.5
Savannah	20.0	17.0	7.0	*12.0
Birm'ham, Ala.	21 0	18 0	8.0	12.0
Mobile	22.0	19 0	9.0	11.0
Montgomery	22.0	19 0	9.0	12.5
Jackson, Miss.	21 0	18.0	7.0	*13.0
Vicksburg	20 5	17.5	7.0	*13.0
Jacksonville, Fla.	20 5	17 5	8 0	11.0
Miami	20.5	17.5	8.0	†11.5
Pensacola	22 0	19 0	9.0	12.0
Tampa	21 5	18 5	8.0	11.0
Lexington, Ky.	20.0	17.0	6.0	11.0
Covington	19.5	16.5	6.0	11.0
Louisville	20.0	17.0	6.0	10.5
Paducah	20.0	17.0	6.0	10.0

Price basis to tank-wagon consumers: Effective January 4, 1937, 3 cents per gallon below tank-wagon price. Kerosene prices in all states subject to 2 cents discount except in Kentucky where prices are net.

*Includes 1-cent state tax. †Subject to 2-cent discount.

Montgomery, Ala., has a county tax of 1 cent per gallon, and a city tax of 1 cent per gallon on gasoline, in addition to state tax; and 1 cent per gallon on kerosene. Mobile, Ala., has a city gasoline tax of 2 cents per gallon; Birmingham, Ala., has a city gasoline tax of 1 cent per gallon; Pensacola, and Tampa, Fla., have a city gasoline tax of 1 cent.

Rocky Mountain District

CONTINENTAL OIL CO.

	Gasoline Dealer	Inc. tax	Kero. tank-wag.
Denver, Colo.	17.5	5.0	11.5
Grand Junction	20.9	5.0	15.0
Pueblo	16 0	5.0	10.5
Casper, Wyo.	18.0	5.0	11.5
Cheyenne	18.0	5.0	13.0
Butte, Mont.	19.5	6.0	15.5
Billings	21.5	6.0	15.5
Helena	21.5	6.0	15.5
Great Falls	21.5	6.0	15.5
Salt Lake, Utah	19.5	5.0	16.0
Twin Falls, Ida.	21.5	6.0	18.0
Boise	21.5	6.0	18.0
Albuquerque, N. M.	17.5	6.5	12.0

Ohio

STANDARD OIL CO. OF OHIO

	Gasoline Tank wag. con'r.	Di-vided dlr.	Inc. tax	Kero. tank-wag.
Ohio points	17 5	16 5	5 0	*13 5

*Includes state tax of 1 cent.

Divided dealer price is also price to authorized agents, exclusive of .5 cent rental. Tank-wagon price is price to commercial consumers in deliveries of 25 gallons or more; less than 25 gallons get service-station price.

Pacific Coast Territory

STANDARD OIL CO. OF CALIFORNIA

	Gasoline Tank wag.	Serv. sta.	Inc. tax	Kero. tank-wag.
San Francisco	17 5	18 5	4 0	11.5
Los Angeles	17 0	18 0	4 0	9.0
Fresno, Calif.	18 5	19 5	4 0	12.0
Phoenix, Ariz.	21 0	22 0	6 0	‡16.0
Reno, Nev.	20 0	21 0	5 0	13 0
Portland, Ore.	20 0	21 0	6 0	13.5
Seattle, Wash.	20 0	21 0	6 0	13.5
Spokane	23 0	24 0	6 0	16 5
Tacoma	20.0	21.0	6.0	13.5

‡Includes 5-cent state tax.

Discounts to dealers: On gasoline, off tank-wagon price, to 100 per cent dealers, 3 cents; to split dealers, 2 cents. To commercial consumers: on tank-wagon price: on single deliveries of 40 gallons and over, advance quantity discount extended at time of delivery, 3 cents. Service station schedule applies on single deliveries less than 40 gallons. On kerosene in tankcar, transport truck and trailer delivery, 3 cents off tank-wagon price; plant deliveries to jobbers, 2.5 cents below tank-wagon.

New York and New England

SOCONY-VACUUM OIL CO., INC.

	Gasoline Tank wag. dlr.	Tank car con'r.	Inc. tax	Kero. tank-wag.
Albany, N. Y.	15 0	13.5	5.0	8.25
*Met. N. Y.:				
Manh't'n, Br'nx	14.5	13.0	5.0	7 75
Staten Island	14.75	13 0	5.0	7.75
Q'ns & Brklyn	14 5	13 0	5 0	7.75
Buffalo	15 3	13 67	5 0	8 00
Rochester	15 3	13.74	5.0	8.25
Syracuse	15 3	13 7	5.0	9.00
Boston, Mass.	14.0	12.5	4.0	7.50
Portland, Me.	15 8	13 5	5 0	8.50
Manch'ter, N. H.	16 3	14 0	5 0	8 50
Burlington, Vt.	15.9	13.9	5.0	8.75

*Does not include 2 per cent city sales tax which is calculated on basis of net retail price exclusive of state and federal taxes.

Price basis to undivided dealer: Posted dealer tank-wagon price less .5 cent. Price basis to commercial consumer: Effective Nov. 15, 1936, monthly purchases of 25,000 gallons and over, consumer tankcar prices at delivery point plus .5 cent per gallon; monthly purchases of 5,000 to 25,000 gallons, undivided dealer price at delivery point: Monthly purchases under 5,000 gallons, pay divided dealer tank-wagon price at delivery point.

Nebraska

STANDARD OIL CO. OF NEBRASKA

	Gasoline Tank wag.	Dlr.	Inc. tax	Kero. tank-wag.
Omaha	18 4	16.9	6 0	10 4
McCook	18.0	17.6	6.0	10.0
Norfolk	18 8	17 3	6 0	10 8
North Platte	19 2	17 7	6 0	11 2
Scotts Bluff	19.9	18.4	6.0	10 9

Discounts to commercial consumers for tank-wagon deliveries covered only by standard commercial consumers contract, effective Jan. 1, 1935.

Oklahoma and Arkansas

CONTINENTAL OIL CO.

	Gasoline Dealer	Inc. tax	Kero. tank-wag.
Muskogee, Ok.	15.0	5.0	7.0
Oklahoma City	15.0	5.0	8.0
Tulsa	14.0	5.0	7.0
Ft. Smith, Ark.	15.0	5.0	10.0
Little Rock	17.5	7.5	9.5
Texarkana	15.0	5.0	9.0

Texas

	Gasoline Tank wag.	Serv. sta.	Inc. tax	Kero. tank-wag.
Dallas, Tex.	14 0	18 0	5 0	8.0
Fort Worth	14.0	18 0	5 0	8.0
Houston	14.5	18.5	5 0	8.0
San Antonio	14.5	18.5	5.0	8.0

Central South District

STANDARD OIL CO. OF LOUISIANA

	Gasoline Tank wag. dlr.	Tank car con'r.	Inc. tax	Kero. tank-wag.
N. Orleans, La.	20 0	17 5	*10.0	†14.0
Baton Rouge	18 0	15 5	8 0	12.0
Alexandria	18 5	16 0	8.0	12.0
Lafayette	19 0	16 5	8.0	12.5
Lake Charles	19 0	16 5	8 0	12.5
Shreveport	17 5	15 0	8.0	9.5
Knoxville, Tenn.	21 0	18.5	8.0	14.0
Memphis	19 0	16 5	8 0	12.0
Chattanooga	20 5	18 0	8 0	13.5
Nashville	20 0	17 5	8 0	11 0
Bristol	19.75	18.5	8.0	14.5

*Includes 2-cent parish tax. †Includes 1-cent parish tax and 1-cent state tax.

Standard of La. has transferred all stations to dealers except in New Orleans and Baton Rouge where station prices are 23.5 and 21.5 cents per gallon, respectively.

Price basis to commercial consumers: Effective May 15, 1937, deliveries of 50 gallons or more in one delivery takes posted consumer tank-wagon price. Accounts taking deliveries of less than 50 gallons at one time pay posted consumer tank-wagon price plus 4 cents per gallon. Generally, the posted consumer tank-wagon price will be equivalent to the dealer price less .5 cent per gallon.

Louisiana kerosene prices include 1-cent state tax.

Pennsylvania, Delaware and Part of New England

ATLANTIC REFINING CO.

	Gasoline Tank wag. dlr.	Tank car con'r.	Inc. tax	Kero. tank-wag.
Philadelphia, Pa.	14.0	12.5	5.0	10.5
Pittsburgh	15.5	13 5	5 0	11.0
Allentown	14.5	13.25	5.0	11.0
Erie	14.5	13.0	5.0	10.0
Scranton	14.5	13.25	5.0	11.0
Altoona	15.5	13.5	5 0	11.0
Dover, Del.	14.5	....	5.0	11.0
Wilmington	13 5	....	5 0	11.0
Springf'ld, Mass.	14.8	....	4.0	7.5
Worcester	14 3	....	4 0	8.0
Hartford, Conn.	14.6	....	4.0	7.0
New Haven	14.0	....	4.0	7.0
Providence, R. I.	13.0	....	3.0	7.75

Atlantic has transferred all stations to dealers except in Philadelphia and Pittsburgh where prices are 17.5 and 20.0 cents per gallon respectively.

Price basis to undivided dealers—Dealer tank-wagon less .5 cent per gallon.

Consuming accounts not under contract—when made by tank-wagon in quantities of 50 gallons or over, dealer price.

Commercial accounts under contract—annual consumption 2,500 to 100,000 gallons per year, 1 cent above posted tankcar price; over 100,000 gallons per year, .5 cent above posted tankcar price.

Naphtha

STANDARD OIL CO. (INDIANA)

	Tank-wagon*
Oleum spirits	15.7
V.M.&P. naphtha	16.0
Cleaners' naphtha	15.0
Stanisol	15.0

*Prices include 3-cent Illinois tax, but not 1-cent federal tax or 2 per cent retail occupational tax.

Prices f.o.b Chicago. Each price subject to discount of 1 cent per gallon for 150 gallon lots if covered by contract.

Canada*

3 Star Imperial Gasoline
IMPERIAL OIL, LTD.

	Gasoline Tank wag.	Serv. sta.	Inc. tax	Kero. tank-wag.
Hamilton, Ont.	22 0	....	6.0	17.0
Toronto, Ont.	22.0	24.5	6 0	17.0
Brandon, Man.	29.8	32.8	7 0	22.8
Winnipeg, Man.	28.2	31.2	7.0	20.7
Regina, Sask.	29 5	....	7.0	22.0
Saskatoon, Sask.	32.3	....	7.0	24.8
Edmonton, Alta.	30.5	33.5	7.0	24.2
Calgary, Alta.	28 0	31.0	7 0	21.5
Vancouver, B. C.	22 0	26.0	7.0	23.0
Montreal, Que.	19 0	....	6 0	17.5
St. John, N. B.	24.0	28.0	8 0	18.5
Halifax, N. S.	24.0	28.0	8.0	18.5

*Imperial gallon used in Canada.

Discount to dealers: Divided dealers pay 3 cents per gallon below station price; undivided dealers pay 4 cents per gallon below station price except in cities of Hamilton, Toronto and Montreal when discounts below station prices are one-half cent per gallon less and in Vancouver where discounts are 1 cent per gallon more.

Retail Price Changes

Standard Oil Co. (Indiana) advanced tank-wagon kerosene 3 cents in Des Moines, Davenport and Sioux City on May 12, April 16 and March 26, respectively, following the imposition of a 3-cent state tax.

Standard Oil Co. of New Jersey May 27 advanced dealer and tankcar gasoline .5 cent in Newark.

Walter A. Harris, recently of San Antonio, Tex., is in New York, whence he will sail for Venezuela to represent the Petroleum Machinery Corp. in South America. Mr. Harris' experience in Latin American countries include Tampico, Mexico, and Colombia in the pipe line department of a major oil company.

Byron Meredith, division superintendent of the Sinclair Prairie Oil Co., in East Texas, was elected chairman of the East Texas chapter of the American Petroleum Institute last week.

PRICES OF REFINED PRODUCTS

All quotations f.o.b. plant in cars for interstate or export movement except as otherwise noted

Prices as of June 1, 1937

The following quotations are exclusive of the federal excise taxes of 1 cent a gallon on gasoline and 4 cents on lubricating oils.

Refinery Gasoline

OKLAHOMA (Group 3)—

U. S. Motor grades:		
62 oct. and below (3d gr.)	.05⅛	.05⅜
63-67 octane	.05½	.05⅝
68-70 octane (regular)	.06⅛	.06¼
60-62 400 grades:		
62 oct. and below (3d gr.)	.05⅛	.05⅜
63-67 octane	.05½	.05⅝
68-70 octane (regular)	.06⅛	.06¼
64-66 375		.05¼
68-70 360	.05⅜	.05½

NORTH TEXAS—

U. S. Motor grades:		
62 octane and below	.05⅛	.05⅜
63-67 octane	.05½	.05⅝
68-70 octane (regular)	.06⅛	.06⅜
60-62 400	.05⅛	.05¼
64-66 375	.05⅛	.05¼

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)—

U. S. Motor grades:		
62 octane and below		.05⅝
63-67 octane		.06
68-70 octane (regular)		.06½
62 octane and below		.05½

ARKANSAS (Ark., N. La., Miss. del.)—

U. S. Motor grades:		
62 octane and below		.05½
63-67 octane		.06¼
68-70 octane (regular)		.06½

CHICAGO (Based on Group 3)—

U. S. Motor grades:		
62 octane and below	.05⅛	.05¼
63-67 octane	.05½	.05⅝
68-70 octane (regular)	.06⅛	.06¼
60-62 400 grades:		
62 octane and below	.05⅛	.05¼
63-67 octane	.05½	.05⅝
68-70 octane (regular)	.06⅛	.06¼
64-66 375	.05⅛	.05¼
68-70 360	.05¼	.05⅜

PENNSYLVANIA (inland refineries)—

58-60 U. S. Motor:		
Below 60 octane		.05¾
60-64.9 octane	.07	.07¼
65-70 octane	.07¼	.07½
64-66 375		.05⅝
68-70 350		.05⅞

CALIFORNIA (domestic movement)—

54-58 U. S. Motor	.07½	.08½
58-60 400, 65 oct. and higher	.08¼	.09¼

EAST COAST (domestic)—

U. S. Motor below 60 octane:		
*New York (Bayonne)		.06¾
Baltimore		.06¾
U. S. Motor, 60-64.9 octane:		
*New York (Bayonne)		.07
Philadelphia	.07	.07¼
Boston		.07¼
Baltimore	.07	.07¼
Charleston, S. C.		.07¼
U. S. Motor, 65 and above:		
*New York (Bayonne)		.07¼
Philadelphia	.07¼	.07½
Boston		.07½
Baltimore	.07¼	.07½
Charleston, S. C.		.07½

*All grades of gasoline one-eighth to one-fourth cent less for barge shipments. New York harbor prices are for New York and New England delivery. Prices for New Jersey delivery one-fourth cent lower.

GULF COAST (domestic)—

U. S. Motor grades:		
Below 60 octane	.06	.06⅛
60-64.9		.06¾
65 octane and higher		.06½

Naphtha

PENNSYLVANIA (inland refineries)—

50-52 450 (blending)	.05⅝
52-54 450 (blending)	.05⅝
54-56 450 (blending)	.05¾

Natural Gasoline

OKLAHOMA (Group 3)—

Grade 26-70		.03½
Grade 18-55	.04⅛	.04¼

NORTH TEXAS—

Grade 26-70		.03½
Grade 18-55	.04⅛	.04¼

CALIFORNIA—

75-85 375-390	.06¾	.07½

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)—

Grade 26-70	.03¾	.03⅞

Tractor Fuel

OKLAHOMA (Group 3)—

40-42 gr., 315-325 i.b.p., 110 flash, 540-550 e.p.	.04⅛	.04⅜
41-43 gr., 300-350 i.b.p., 110-125 flash, 500-520 e.p.	.04¼	.04½
46-48 gr., 210-230 i.b.p., 480 max. e.p.	.04⅞	.05

Kerosene

(All kerosene water white)

OKLAHOMA (Group 3)—

41-43	.04¼	.04⅜
42-44	.04⅜	.04½

NORTH TEXAS—

41-43		.04⅜

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)—

41-43		.04½

ARKANSAS (Ark., N. La., Miss. del.)—

41-43		.04¾

PENNSYLVANIA (inland refineries)—

45		.04¾
46		.04⅞
47		.05

CHICAGO (Based on Group 3)—

41-43	.04¼	.04⅜
42-44	.04⅜	.04½

CALIFORNIA (Pac. Coast market)—

38-43 high burning test	.04	.05

NEW YORK (Bayonne, N. J.)—

41-43		.05½

***GULF COAST (domestic)—**

41-43	.04¾	.05

*Barge price one-eighth cent lower.

Furnace Oil

OKLAHOMA (Group 3)—

No. 1 prime white, 38-42	.03⅞	.04
No. 1 straw, 38-40	.03⅝	.03⅞
No. 2 straw, 32-36	.03½	.03⅝
No. 2 dark, 32-36	.03⅜	.03½
No. 3, zero to 15, 28-32	.03¼	.03⅜
No. 3, 15 and above, 28-32	.02⅝	.02¾

NORTH TEXAS—

No. 1 prime white, 38-42		.04
No. 1 straw, 38-40	.03⅝	.03⅞

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)—

No. 2, 32-36	.03⅜	.03½

ARKANSAS (Ark., N. La., Miss. del.)—

No. 2, 32-36	.03⅝	.03¾

CHICAGO (based on Group 3)—

No. 1 prime white, 38-40	.03⅞	.04
No. 1 straw, 38-40	.03⅝	.03¾
No. 2 straw, 32-36	.03½	.03⅝
No. 2 dark, 32-36	.03⅜	.03½
No. 3, zero to 15, 28-32	.03¼	.03⅜
No. 3, 15 and above, 28-32	.02⅝	.02¾

NEW YORK (Bayonne, N. J.)—

*No. 1		.05¾
*No. 2		.05⅝
*No. 4		.05⅛

*Barge deliveries one-eighth to one-fourth cent under above, tankcar price.

Gas Oil and Fuel Oil

(Gas oil per gal.; fuel oil per bbl.)

OKLAHOMA (Group 3)—

U.G.I. gas oil	.02⅞	.03⅛
No. 4, low cold test, 24-28	1.07½	1.12½
No. 4, 15 and above, 24-28	.90	.95
No. 5, low cold test, 18-22	.87½	.90
Below 18 fuel oil, industrial	.80	.87½

NORTH TEXAS—

U.G.I. gas oil	.02¾	.03⅛
No. 4, low cold test, 24-28	1.07½	1.12½
No. 5, low cold test, 18-22	.87½	.90
Below 18 fuel oil, industrial	.80	.85

NORTH LOUISIANA (Ark., N. La. and Miss. delivery)—

10-14 fuel oil, industrial	.80	.85

ARKANSAS (Ark., N. La., and Miss. delivery)—

10-14 fuel, oil industrial		.70

CHICAGO (Based on Group 3)—

U.G.I. gas oil	.02⅞	.03
No. 4, low cold test, 24-28	1.07½	1.12½
No. 4, 15 and above, 24-28	.90	.95
No. 5, low cold test, 18-22	.87½	.90
No. 6, low cold test, 10-16	.80	.85

PENNSYLVANIA (inland refineries)—

36-40	.04⅝	.04½

CALIFORNIA—

Los Angeles:		
30-34 gas oil, per bbl.	1.15	1.35
24 plus diesel, per bbl.	1.17	1.35
24 plus diesel (bunkers)	1.50	1.65
12-16 (bunkers at tidewater)	1.05	1.20
10-16 (cargo lots)	.95	1.10
12-17 (tankcars)	1.00	1.15
10-17 (high sulfur)	.60	.90
San Joaquin Valley:		
10-18 (tankcars)	.75	1.05
24 plus diesel, per bbl.	1.45	1.65
San Francisco:		
27 plus diesel		1.65
24 plus diesel (bunkers)		1.70
10-16 (bunkers)		1.20

GULF COAST—

28-30 gas oil	.03⅞	.04⅛
28-30 diesel (bunkers)	1.65	1.90
Bunkers (bulk cargoes)		.95
Bunker C (bunkers)		1.05

NEW YORK (Bayonne, N. J.)—

27 plus, gas oil		.04¾
28-30 diesel (lighterage 6¼-per bbl.)		2.10
28-30 diesel (tankcars)		.04¾
Bunker C (to ocean-going ships in N. Y. harbor)	1.35	1.50
Industrial fuel (tankcars)		.04½

*Lighterage charge 5c bbl. additional.

Bright and Steam Refined

OKLAHOMA (Group 3)—

Bright Stocks:		
190-200 D, 15-25		.23
150-160 D, 0-10		.20
150-160 D, 15-25		.19½
150-160 E, 15-25		.19
100-110 D, 0-10		.18
Steam refined:		
631 green (treated)		.17½
600 dark green (untreated)		.05

PENNSYLVANIA—

Bright Stocks (Pennsylvania Grade No. 8 color, 145-50 at 210, 540-550 flash):		
10 pour test	.28	.28½
15 pour test	.27	.27½
20 pour test	.26	.26½
25 pour test	.25	.25¼
Steam refined:		
600		.17
650		.19
600 Pennsylvania flash		.20
630 flash		.23½
600 Warren E filtered		.20

Neutral Oil

(Vis. at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—

Zero to 10 Cold Test:		
150-3		.09
180-3		.10
180-4		.09½
200-3		.10½
200-4		.10
250-3		.11½
250-4		.11
280-3		.12½
280-4		.12
300-3½		.13
400-3½		.14
100-2½ paraffin oil		.05¾
15-20 Cold Test:		
200-3		.10
200-4		.09½
250-3		.11
250-4		.10½
280-3		.12
280-4		.11½

GULF COAST—

Pale Oils:		
200-3	.07	.07¼
300-3	.07½	.07¾
500-3½	.08½	.08¾
750-3½	.08⅝	.09¼
1,200-3½	.09½	.09¾
1,500-4	.09¾	.10
Red Oils:		
200-5-6	.07¼	.07½
300-5-6	.07¼	.07½
500-5-6	.08	.08½
750	.08¾	.09
1,200-5-6	.09¼	.09½

CALIFORNIA (moving to dom. market)

Pale Oils:		
100-2½-3	.07	.08
200-2½-3	.07	.08
300-2½-3	.07	.08
400-3-4	.09	.11
540-3-4	.09	.11
550-3-4	.09	.11
600-3-4	.09	.11
Red Oils:		
200-4-5	.07	.08
300-5-6	.07	.08
350-5-6	.10½	.11½
400-5-6	.10½	.11½
450-5-6	.10½	.11½
500-5-6	.10½	.11½
600-5-6½	.10½	.11½
700-6½ plus	.10½	.11½
750-6½ plus	.10½	.11½
900-6½ plus	.10½	.11½

PENNSYLVANIA—

150 vis. at 750° F. color, 400-405 flash:		
Zero pour test	.25½	.26
10 pour test	.24½	.25
15 pour test	.24	.24½
25 pour test	.23	.23½
180 vis. at 70° F., 3 color:		
25 pour test	.26	.26½
200 vis. at 70° F., 3 color:		
Zero pour test	.30	.30½
10 pour test	.29	.29½
15 pour test	.28½	.29
25 pour test	.27½	.28

Wax and Petrolatum

(Prices per pound)

OKLAHOMA (Group 3)—

124-126 (a.m.p.) w.c. scale	.02¾	.02⅞

PENNSYLVANIA (inland refinery)—

122-124 (a.m.p.) w.c. scale	.0265	.0270
124-126 (a.m.p.) w.c. scale	.0270	.0275

NEW YORK—

Wax in bags fully refined:		
122-125 (a.m.p.) wax		.0445
125-127 (a.m.p.) wax		.0455
128-130 (a.m.p.) wax		.0480
130-132 (a.m.p.) wax		.0505
133-135 (a.m.p.) wax		.0535
135-137 (a.m.p.) wax		.0560
124-126 (a.m.p.) w.s.	.0250	.0255
124-126 (a.m.p.) y.s.	.0260	.0265
Petrolatum in barrels, carload lots:		
Dark green		.01⅞
Amber	.02⅞	.03
Extra amber	.03	.03⅛
Lily white	.06⅝	.06¾
Snow white	.07¾	.07⅞
Cream	.05⅝	.05¾

Export Prices

GASOLINE

GULF COAST—

U. S. Motor	.05⅞	.06
60-62 400		.05⅝
61-63 390	.05⅞	.06
64-66 375	.06⅛	.06¼

LOS ANGELES—

U. S. Motor grades:		
53-55 octane		.04¾
55-65 octane	.04¾	.05
65-67 octane		.05
67-69 octane		.05¼
Above 69 octane	.05½	.06

KEROSENE

GULF COAST—

41-43 prime white	.04½	.05
41-43 water white	.04½	.05
44 water white	.04¾	.05

LOS ANGELES—

41-43 water white	.04½	.05

LUBRICANTS

(Pennsylvania Grade)

NEW YORK (f.a.s. in bbls.)—

Cylinder Stocks:		
600 Warren E	.26½	.27
600 S.R. unfiltered		.24
630 S.R. unfiltered		.25½
600 flash, S.R.		.26½
630 flash, S.R.	.32	.32½
Bright Stocks:		
8 color	.32	.32½
6½ plus color in dilution		.31½

NEUTRAL OIL

200-3 color	.32½	.33
150-3 color	.29	.29½

PARAFFIN WAX

NEW YORK (prices per pound)—

123-126 a.m.p.		.04125
125-127 a.m.p.		.0425
128-130 a.m.p.		.0450
133-135 a.m.p.		.0525
135-137 a.m.p.		.0550
Crude scale:		
124-126 w.s.	.0260	.0270
124-126 y.s.	.0245	.0250

CRUDE OIL PRICES

Oklahoma, Kansas, North Central and East Central Texas

(January 28, 1937)

East Texas (May 22, 1937)*	$1 35
Van, Tex.†	1.10
Camp Hill, Tex.	1.27
Cass County, Tex.‡	1.25
Talco	.73
Altus and Tipton, Okla.§	1.20
Other fields (see gravity table).	

*All companies. †Humble Oil & Refining Co.; Pure Oil Co. ‡Texas Co. §Gulf Oil Co. Talco by Humble Oil & Refining Co.

West Texas

See gravity table.

Pecos County*	.91
Pecos shallow†	.81

*Shell Petroleum Co., Gulf Pipe Line Co., and Humble Oil & Refining Co. †Shell Petroleum Corp.

Gulf Coast

(January 28, 1937)

Choctaw and Darrow, La. See note below	
Clay Creek, Tex.	$1.00
Garden Island, La.	1.37
Cleveland, Tex.	1.27
Hardin, Tex.	1.15
Tomball, Tex.	1.30
Lafitte, La.	1.24
Livingston, Tex.	1.27
Batsuma	1.20
Heyser, light (Nov. 1, 1936)	1.15
Heyser, heavy (Nov. 1, 1936)	.90
Placedo (Nov. 1, 1936)	.90
Welsh, La.	.98
Tepetate (La.) (Jan. 4, 1937)	1.12

Greta, Refugio, O'Connor, McFadden, Saxet, Segno, Taft, Tomoconnor and Plymouth take same gravity prices as Gulf Coast, Duval, Jim Hogg, Webb and Zapata counties, Texas, and Heyser and Placedo fields take Mirando gravity prices. Jennings, La., 5 cents lower than Gulf Coast prices on each degree. Segno, Texas, takes Gulf Refining Co.'s Gulf Coast prices. Choctaw and Darrow, Louisiana, posted for first time by Standard Oil Co. of Louisiana, start below 21 degrees at 90 cents, with 3-cent differential up to 25 gravity, then 2-cent differential up to 40 and above, $1.36.

Rocky Mountain States

(Effective January 28, 1937)

Iles, Colo., light*	$1.18
Iles, Colo., heavy*	1.12
Greybull, Wyo.*	1.30
Torchlight, Wyo.*	1.30
Grass Creek, Wyo., light.*†	1.30
Grass Creek, Wyo., heavy (Nov. 4, 1936)*†	.62
Hamilton Dome, Wyo. (Nov. 4, 1936)*	.57
Elk Basin, Wyo., light*†	1.30
Frannie, Wyo., heavy*	.82
Frannie, Wyo., light	.82
Hogback, N. Mex.*	1.33
Pondera, Mont. (Jan. 26, 1936)*	1.05
Salt Creek, Dutton Creek and Midway, Wyo., take Stanolind's Oklahoma prices on a gravity basis.	
Big Muddy, Wyo.†	1.23
Rock Creek, Wyo.†	1.20¼
Lea County, N. M. (see West Texas gravity table).	
Artesia, N. Mex.	.90
Maljamar, N. Mex.	.90
Canon City and Florence, Colo.	1.10
Florence, Colo.	.98
Lance Creek, Wyo.	.97
Sunburst, Mont. (June 5, 1936)	1.20
Cat Creek, Mont.	1.40
Cut Bank, Mont.	1.35

*Stanolind Oil & Gas Co. †Ohio Oil Co. ‡Continental Oil Co. Cut Bank by Toronto Pipe Line Co.

Middle Western States

OHIO OIL CO.
(Effective January 28, 1937)

Lima	1.25
Illinois	1.35
Princeton, Ind.	1.35
Midland, Mich.	1.42
West Branch, Mich.	1.26
Buckeye (March 16, 1937)	1.39¼
Arenac, Mich.	1.26
Muskegon, Mich.	1.00
Eastern Kentucky:	
Big Sandy River	1.42
Kentucky River	1.50
Western Kentucky	1.40

Midland, Mich., price posted by Simrall Corp. and Pure Oil Co. includes Greendale, Porter, Beaverton, Crystal and equal grades. West Branch and Arenac by Simrall Corp., effective January 29. Eastern Kentucky crude purchased by Ashland Refining Co., Ashland, Ky. Buckeye posted by Simrall Corp. and Pure Oil Co.

Southwest Texas

(January 28, 1937)

Pettus	1.37
Salt Flat, Darst Creek, Hilbig, Carroll Clark, Zoboroski	1.39
Luling	1.00
Lytton Springs	1.12

Saxet and Taft take same gravity table as Gulf Coast.

North Louisiana and Arkansas

Smackover, all grades	$ .90
Tullos and Urania	1.02
El Dorado East field	.90
Union County, Ark.	.90
Ouachita County, Ark.	.90

Eastern States

TIDE WATER PIPE LINE CO.
(Effective Feb. 24, 1937)

Bradford, Pa.	$2.67
Allegany, N. Y.	2.67

SOUTH PENN OIL CO.
(Effective Feb. 24, 1937)

Pennsylvania Grade Oil in National Transit Lines (Bradford field)	2.67
Pennsylvania Grade Oil in Southwest Pennsylvania Lines	2.42
Pennsylvania Grade Oil in Eureka Pipe Line lines	2.37
Pennsylvania Grade Oil in Buckeye Pipe Line lines	2.22
Corning Grade Oil in Buckeye Pipe Line Co.'s lines (Jan. 29, 1937)	1.42

PENNZOIL CO.
(Effective Feb. 24, 1937)

Pennsylvania Grade Oil in National Transit Lines:	
Group A	2.67
Includes Cochran, Franklin, Hamilton and Doolittle districts.	
Group B	2.66
Includes Tidioute district.	
Group C	2.65
Includes Turkey and Tidioute districts.	
Group D	2.64
Includes Bear Creek and Porkey districts.	
Group E	2.61
Includes Eldeneau, Bull Creek, Rough Run, Carbon, Dipner, Bredlin, McJunkin, Jameson, Kenerdell, Emlenton, Tiona, Lacey and Kinzua districts.	

Price depends on lengths of pipe line haul to plant at Oil City.

PURE OIL CO.
(Effective Feb. 24, 1937)

Cabin Creek, W. Va.	2.37
Bradford Hollow, W. Va.	2.37
Kelly Creek, W. Va.	2.37

Canada

Ontario (Sept. 9, 1933)*	
Petrolia	$2.10
Oil Springs	2.17
Turner Valley, Alberta province (Dec. 16, 1936):†	
Clear naphtha	$2.60
Discolored naphtha, 65 gravity and higher	2.36
Discolored naphtha and crude oil, 40-40.9 gravity	1.58
Increasing 3 cents for each degree of gravity with top price for 64-64.9 gravity	2.37

These prices delivered field tankage.
*Imperial Oil, Ltd.
†Imperial Oil, Ltd., and Regal Oil & Refining Co. On crude oil alone British American Oil Co. posted above prices on December 9, 1936.

Mexico

Panuco*	$1.24

*In U. S. currency, f.o.b. ship, based on April spot market transactions.

Texas Wildcats

(Continued from Page 178)

Ward County

F. H. Murphy et al No. 1 Monroe, sec. 210, Blk. 34, H.&T.C. Sur. R.U.S.T.

Magnolia Pet. Co. No. 1-55 Sealey, sec. 55, Blk. F, G.M.M.B.&A. Sur. T.D. 3,010 ft.; P.B. to 2,985 ft.; drlg. out plug.

L. F. White et al No. 1 Rector-Monroe, E cor. sec. 3, Blk. 1, W.&N.W. Sur. Top Del. L. 4,635 ft.; top Del. sd. 4,670 ft.; S.O. 4,690 ft.; T.D. 4,700 ft.; P.B. 4,698 ft.; shot; lost bailer.

Yoakum County

Bahan et al No. 1 Shook Est., sec. 420, Blk. D, John H. Gibson Sur. Drlg. 4,278 ft.

Magnolia Pet. Co. No. 1 Mrs. M. E. Taylor, sec. 201, Blk. D, John H. Gibson Sur. Elev. 3,607 ft.; top Yates 3,040 ft.; T.D. 4,024 ft.; R.U.S.T.

Moore Bros. No. 1 Cleveland, sec. 706, Blk. D, J. H. Gibson Sur. Loc.

New York Market

(Continued from Page 183)

level at the end of winter. Many companies admit that their ability to supply customer demand would have been heavily taxed had last winter's temperatures dropped to normal expectancy.

The lubricating oil market is fairly well maintained, although bright stocks are probably offered a little more freely and neutral stocks are not so difficult to find as two weeks ago. The demand, however, remains sufficient to maintain current quotations. Interest by exporters in the bright stock market remains dormant.

Varnish makers and painters naphthas and mineral spirits were generally advanced in this territory at the start of last week a half cent per gallon in tankcar and tank-wagon quotations. Socony-Vacuum Oil Co., Inc., Standard Oil Co. of New Jersey and Atlantic Refining Co. made the naphtha advances at New York, Newark and Philadelphia to a price range of 10.5 to 11 cents per gallon in tankcars at refineries or seaboard terminals.

Scale and fully refined waxes remain unchanged with little feature to the current trading. Prices for crude scale wax, 124-126 a.m.p. ranges from 2.75 to 2.80 cents per pound in western Pennsylvania and from 2.70 to 2.75 at New York for export. Fully refined wax ranges from 4.45 to 5.60 cents per pound at New York to domestic consumers with export business possible at fractionally lower quotations.

Crude Prices by Gravities

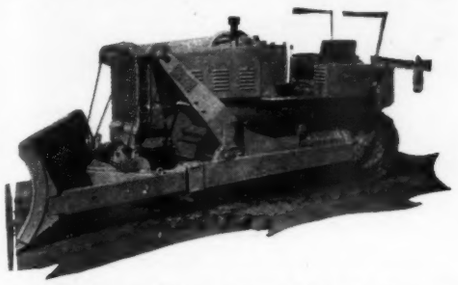
	Oklahoma-Kansas 1	Oklahoma-Kansas 2	North and Central Texas 3	East Central Texas (Mexia district) 4	North Louisiana-Arkansas 5	Gray County, Texas 6	Hutchinson-Carson counties, Texas 7	Rodessa, Louisiana-Texas and Panola County, Texas 8	Conroe, Tomball, Raccoon Bend, Satsuma, Texas 9	Gulf Coast 10	Gulf Coast 11	West Texas except Pecos County, Lea County, N. Mex. 12	Mirando district, Texas 13	Marion County, Texas 14	Government Wells, Texas 15	Anahuac, Texas 16	White Castle, Louisiana 17	Iowa, Louisiana 18	Cayuga, Texas 19
Bel. 18	....	....	....	....	....	....	....	....	....	$.90	....	....	....	....	....	....	....	....	....
18-18.9	....	....	....	....	....	....	....	....	....	.92	....	....	....	....	....	....	....	....	....
19-19.9	....	....	....	....	....	....	....	....	....	.94	....	....	....	....	....	$.92	$.94	$.84	....
20-20.9	....	....	....	....	....	....	....	....	....	.96	$.95	....	$.90	....	$.90	.94	.96	.86	....
21-21.9	....	....	....	....	....	....	....	....	....	.98	.98	....	.93	....	.96	.96	.98	.88	....
22-22.9	....	....	....	....	....	....	....	....	....	1.01	1.01	....	.96	....	.96	.98	1.01	.91	....
23-23.9	....	....	....	....	....	....	....	....	....	1.04	1.04	....	.99	....	.99	1.00	1.04	.94	....
24-24.9	....	....	....	....	....	....	....	....	....	1.07	1.07	....	1.02	....	1.02	1.02	1.07	.97	....
Bel. 25	....	$.98	....	....	$.90	....	....	$.93	....	....	....	....	....	$.90	....	....	....	....	$.88
25-25.9	....	1.00	....	....	.92	....	....	.95	....	1.10	1.10	$.78	1.05	.92	....	1.04	1.10	.99	.90
26-26.9	....	1.02	....	....	.94	....	....	.97	....	1.13	1.13	.80	1.08	.94	....	1.06	1.13	1.03	.92
27-27.9	....	1.04	....	....	.96	....	....	.99	....	1.15	1.15	.82	1.10	.96	....	1.08	1.15	1.05	.94
28-28.9	....	1.06	....	....	.98	....	....	1.01	....	1.17	1.17	.84	1.12	.98	....	1.10	1.17	1.07	.96
Bel. 29	$1.06	....	$.96	$1.03	....	....	....	....	$1.20	....	....	....	....	....	....	....	....	....	....
29-29.9	1.08	1.08	.98	1.05	1.00	....	....	1.03	1.22	1.19	1.19	.86	1.14	1.00	....	1.12	1.19	1.09	.98
30-30.9	1.10	1.10	1.00	1.07	1.02	....	....	1.05	1.24	1.21	1.21	.88	1.16	1.02	....	1.14	1.21	1.11	1.00
31-31.9	1.12	1.12	1.02	1.09	1.04	....	....	1.07	1.26	1.23	1.23	.90	1.18	1.04	....	1.16	1.23	1.13	1.02
32-32.9	1.14	1.14	1.04	1.11	1.06	....	....	1.09	1.28	1.25	1.25	.92	1.20	1.06	....	1.18	1.25	1.15	1.04
33-33.9	1.16	1.16	1.06	1.13	1.08	....	....	1.11	1.30	1.27	1.27	.94	1.22	1.08	....	1.20	1.27	1.17	1.06
34-34.9	1.18	1.18	1.08	1.15	1.10	....	....	1.13	1.32	1.29	1.29	.96	1.24	1.10	....	1.22	1.29	1.19	1.08
Bel. 35	....	....	....	....	....	$.96	$.91	....	....	....	....	....	....	....	....	....	....	....	....
35-35.9	1.20	1.20	1.10	1.17	1.12	.98	.93	1.15	1.34	....	1.31	.98	1.26	1.12	....	1.24	....	1.10	....
36-36.9	1.22	1.22	1.12	1.19	1.13	1.00	.95	1.17	1.36	....	1.33	1.00	1.28	1.14	....	1.26	....	....	....
37-37.9	1.24	1.24	1.14	1.21	1.16	1.02	.97	1.19	1.38	....	1.35	1.02	1.30	1.16	....	1.28	....	....	....
38-38.9	1.26	1.26	1.16	1.23	1.18	1.04	.99	1.21	1.40	....	1.37	1.04	1.32	1.18	....	1.30	....	....	....
39-39.9	1.28	1.28	1.18	1.25	1.20	1.06	1.01	1.23	1.42	....	1.39	1.06	1.34	1.20	....	1.32	....	....	....
40,over	1.30	1.30	1.20	1.27	1.22	1.08	1.03	1.25	1.44	....	1.41	1.08	1.36	1.22	....	1.34	....	....	....

Column 1—Companies posting are Barnsdall, Bell, Champlin, Continental, Cushing, Derby, Dickey, Eason, El Dorado, Empire, Falcon, Globe, Gulf, Johnson, Kanotex, National, Phillips, White Eagle, Stanolind, Sunray, Texas, Sun, Vickers and Wilcox.
Column 2—Anderson & Prichard, Carter, Cosco, Deep Rock, Magnolia, Mid-Continent, Pure, Rock Island, Shell, Sinclair, Skelly and Tide Water.
Column 3—All purchasers.
Column 4—Humble Oil & Refining Co. and Sinclair Crude Oil Purchasing Co.
Columns, 5, 6, 7 and 8—All purchasers.
Column 9—Humble Oil & Refining Co. and Sun Oil Co. Tide Water Oil Co.'s schedule starts at 35 degrees, $1.34 with 2-cent spread up to 40 and over at $1.44. (Raccoon Bend prices are for deep sand oil.)
Column 10—The Texas Co. (Gulf Refining Co. pays same prices up to and including 34 gravity, but continues its 2-cent spread up to 40 and over at $1.41.)
Column 11—Humble Oil & Refining Co., Sinclair Prairie Oil Marketing Co., Sun Oil Co.
Column 12—All purchasers.
Column 13—Humble Oil & Refining Co.
Column 14—Magnolia Petroleum Co.
Column 15—Sun Oil Co.
Column 16—Gulf Refining Co.
Columns 17 and 18—Shell Petroleum Corp.
Column 19—Tide Water Oil Co.

NEW OR IMPROVED EQUIPMENT

Full Line of Oil-Field Tractor Units Introduced by Emsco

A complete line of cable- and hydraulic-controlled tractor equipment for oil fields is announced by Emsco Derrick & Equipment Co., Los Angeles, Calif. The company has brought together newly developed units and an established line of



construction machinery. Comprising the line are the bulldozers trailbuilders, and power-control units formerly produced by the Hutchins Winch Co. and the new Emsco-developed hydraulic equipment.

The Emsco cable-controlled trailbuilders and bulldozers are built for all popular size track-laying tractors. Illustrated here is a Cletrac model Emsco bulldozer embodying patented features designed to give low up-keep cost, minimum cable wear and smooth, fast blade operation.

All cable-operated units are powered by the Emsco power-control units, manufactured in both single- and double-drum types. These power-control units are designed to add to the speed, efficiency and economy of the equipment they operate.

For 18 months before placing the hydraulic units on the market Emsco engineers carried on intensive experimental and development work and field tests and they are continuing the same policy with forthcoming units.

Bulletins, Booklets and Other Literature for the Trade

A 20-page illustrated catalog announced by C. J. Tagliabue Manufacturing Co., Park and Nostrand Avenues, Brooklyn, N. Y., tells about Tag Celectray pyrometers for recording, controlling and indicating temperatures.

William M. Barret, Inc., Shreveport, La., has published a booklet on "Development of Magnetometric Methods," in which these methods are described and geophysical surveys made by this organization of consulting geophysicists are discussed.

George P. Reintjes Co., 2517 Jefferson Street, Kansas City, Mo., is mailing to those who ask for it an illustrated bulletin telling how Reintjes simplified arch construction improves furnace structures.

Among articles in the current issue of the Water Tower, published by Chicago Bridge & Iron Co., Chicago, is an illustrated one about the Wiggins balloon system in use by Continental Oil Co. in Ponca City, Okla.

"Oil Industry Profits by Using Marmon-Herrington All-Wheel Drives" is among articles in the current number of Marmon-Herrington News, published by Marmon-Herrington Co., Inc., Indianapolis, Ind.

Foster Wheeler Corp., 165 Broadway, New York, is mailing on request a bulletin presenting detailed information about its new-type "S" stainless-steel expansion joint. It describes the forms in which the joint is produced regularly for pressures up to 150 pounds per square inch.

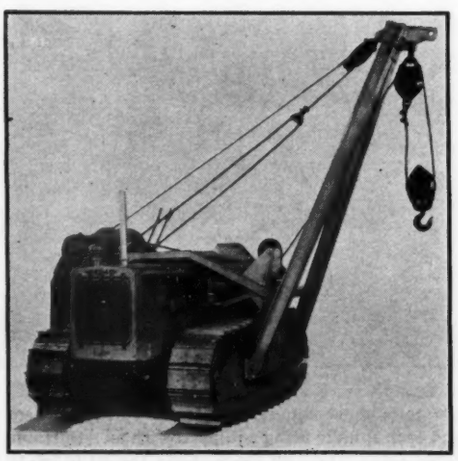
A new catalog covering the complete line of Brown indicating and recording CO_2 meters, as well as the combined CO_2 and flue-gas temperature recorders, is offered by the Brown Instrument Co., Philadelphia, Pa.

"The Fire Extinguishers That Save Recharging Dollars," is the title of a four-page color brochure being distributed by Walter Kidde & Co., Bloomfield, N. J. The new Kidde and antifreeze extinguishers described are said to eliminate many disadvantages of old-type extinguishers.

An ingenious slide-rule indicator for use in selecting the proper instruments for any application, whether central stations, industrial plants or transportation industry, is being distributed by the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. This device shows at a glance what instruments to use, their range, size, descriptive literature available, etc.

United States Rubber Changes

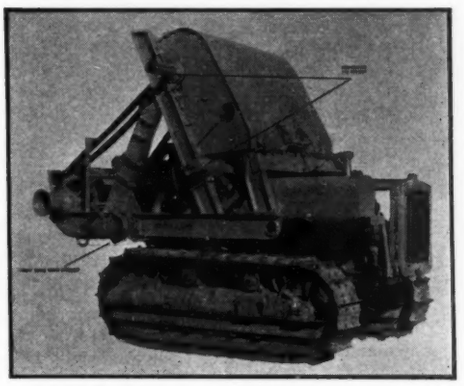
J. E. Power, manager mechanical sales in the New York district for the Mechanical Goods Division, United States Rubber Products, Inc., has been transferred to 1790 Broadway as assistant sales manager, mechanical goods division. R. V. Hilands, manager of the Philadelphia and Baltimore districts, has been appointed manager mechanical sales, New York branch. A. B. Means, of the Philadelphia sales organization, has been appointed manager mechanical sales, Philadelphia and Baltimore branches. R. F. Jackson, of the Baltimore sales organization, has been appointed assistant manager mechanical sales, Baltimore branch. E. P. Cole, of the Denver sales organization, has been appointed manager mechanical sales, Denver branch.



"Caterpillar" diesel RD4 tractor with Trackson pipe-layer

Allsteel Products Is Introducing Tractor-Mounted Drawworks

The Allsteel Products Manufacturing Co., Wichita, Kans., is introducing its new model drilling unit designed to meet the demand for a tractor-



mounted drawworks and cable-tool unit adapted for drilling and servicing to 3,500 feet. Pulling casing from any depth is said to be practicable with this outfit.

This new Cardwell Allsteel double-drum drawworks, single-drum drawworks or cable-tool drilling unit, all in one piece, is mounted on a "Caterpillar" diesel or gasoline tractor. It is of particular value for drilling or oil-well servicing where there are no roads or where for any reason it is impossible to use a truck. The tractor may be used also to move other tools or to skid derricks.

Chief Engineer of International

Clifford R. Athy, chairman of the steel derrick manufacturers subcommittee of the American Petroleum Institute committee on standardization of standard rigs and derricks, has had thorough experience in the field of steel derrick manufacture. For seven years he has been chief engineer of the International Derrick and Equipment Co., Columbus, Ohio, and before that he served as assistant chief engineer. Mr. Athy has made it a practice to visit eastern and Mid-Continent oil fields at intervals to study production practices and do promotional work for his company. He has collaborated with the metallurgical department of Ohio State University, Columbus, in important research work. He has had 13 years' experience in the design and development of oil-field drilling and production equipment.

Wilson & Bennett Expanding

Two new three-story buildings and a third-floor extension are being added to the Chicago plant of Wilson & Bennett Manufacturing Co., makers of steel pails and drums. The 82,000 square feet of space will be used for new production lines, increased warehousing and shipping facilities. Machinery and equipment costing over $200,000 is being constructed for use in the new buildings.

Mudpump Gauge Is Designed to Meet Common Problem

Martin-Decker Corp., Long Beach, Calif., has announced a new slushpump gauge with range high enough to cover the infrequent peaks encountered

in drilling, such as cementing, breaking circulation, etc., but with pressure gradations sufficiently spaced to allow accurate reading of the ordinary low pump pressures encountered in every-day drilling. It thus meets a drilling problem.

Through an ingenious arrangement in the pressure element, the first 1,500 pounds pressure is spread over 240 degrees of dial circumference, allowing easy and accurate vernier readings on all low-pressure work. It quickly shows the small pressure variations that occur when tooljoints, connections, or fluid passages in the bit pump out. The other 1,500 pounds is condensed on only 60 degrees of dial circumference, or one-fourth the spread of the first 1,500 pounds, and thus permits reading of peak pressures up to 3,000 pounds with complete safety.

This new type mudpump gauge is available in a streamlined case recessed for the mounting-bolts and provides a smooth exterior surface without projections to catch the clothing. This improved gauge element is also available to replace the regular element in the older Quintuplex instruments and it can be installed readily without the need of special tools.

J. J. Summersby Advanced

Appointment of J. J. Summersby, assistant vice president of Worthington Pump & Machinery Corp., Harrison, N. J., as general sales manager of that company is announced. This promotion is an extension of Mr. Summersby's previous responsibilities, as it concentrates direction of the general sales department. Mr. Summersby joined Worthington Pump & Machinery Corp. as a sales engineer immediately after his completion of postgraduate work at Washington University in 1920, and has been continuously identified with the company since then, first as district sales manager, then as division sales manager and assistant general sales manager.

Here and There With Men Who Manufacture Equipment

Hanlon-Waters, Inc., has opened a new warehouse and store in Corpus Christi, Tex. Located in Supply Row, the store is the newest addition to that section.

The American Welding Society, 33 West Thirty-ninth Street, New York, has appointed Warner S. Hayes manager. Mr. Hays is a past president of the American Trade Association Executives and is on the executive committee of the Yale Engineering Association.

Mid-Continent Supply Co., Mid-Continent Building, Fort Worth, Tex., has opened a new store at Turnertown, Rusk County, Texas, under the supervision of F. R. Files, manager of the company's Kilgore store.

The Babcock & Wilcox Tube Co., Beaver Falls, Pa., has appointed J. P. Boore assistant general sales manager. For several years he was vice president of Summerill Tubing Co.

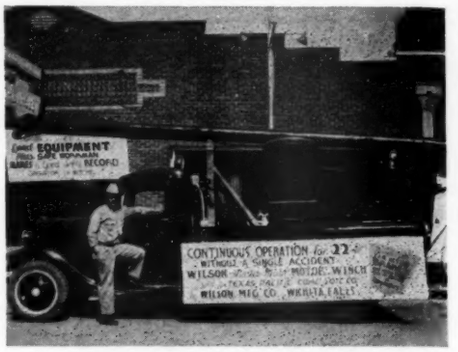
Yarnall-Waring Co., Philadelphia, Pa., has appointed Henry H. Seabrook, Jr., assistant to H. J. Heineman, sales representative in the Pittsburgh territory. Fred Wetherill is now sales engineer in the impulse steam-trap division.

Cecil G. Cooper has joined the Texas Steel Co., Fort Worth, Tex., manufacturer of oil-field equipment, as district representative in charge of the Wichita Falls and Panhandle areas. He formerly represented Decker Tool and Supply Co. in the East Texas and Talco districts.

S. D. Mahan has been appointed general advertising manager of Westinghouse Electric & Manufacturing Co. He is succeeded as manager of merchandising advertising by Roger Bolin.

Wilson Electric Winch Is Used 22 Months Without Accident

A Wilson Super Model electric winch was an exhibit in the oil belt safety conference parade held recently in Breckenridge, Tex. Pictured here



is the winch with a poster on the side which tells its story of 22 months of continuous operation without an accident, which the Wilson Manufacturing Co. says is a record in the oil industry. The company also features portable rigs.

Beaver Pipe Tools, Inc., Warren, Ohio, is distributing an illustrated bulletin on its portable unit for cutting and threading pipe and bolts, the Beaver Model A.

TIMKEN EXPANDS RESEARCH AND TESTING FACILITIES

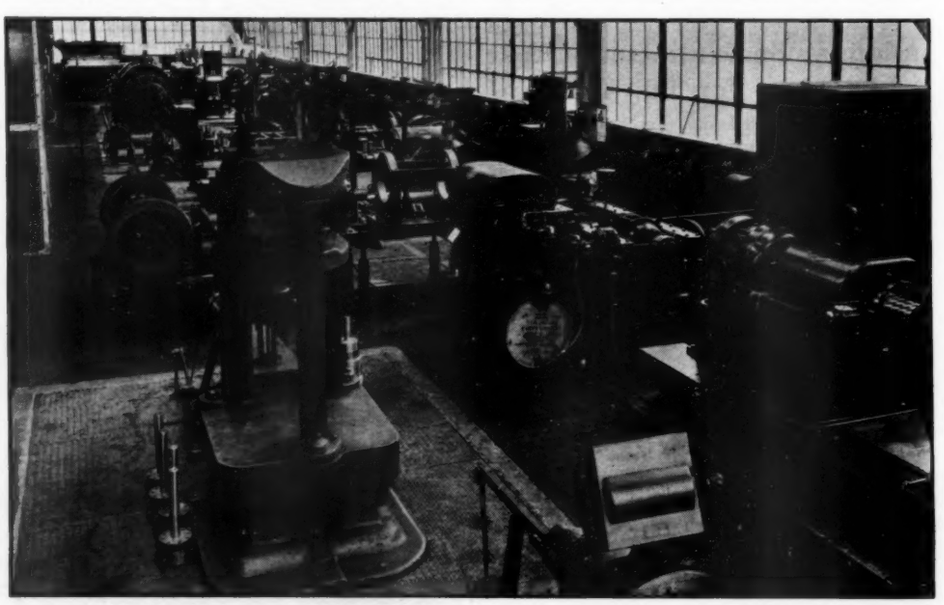
New quarters and additional equipment have expanded the research and testing facilities of Timken Roller Bearing Co., Canton, Ohio, to an extraordinarily high point of efficiency. Housed in a single-story, well-lighted brick building 150 by 80 feet, the laboratory stands across the street from the main office and factory. The illustration shows a general view of the main room in this new laboratory.

The far end of the building is occupied by a battery of eight machines designed to test bearings up to 8 inches O.D. to destruction under radial and thrust load.

Bearings are loaded in these machines by a hydraulic-pressure system, oil being supplied at 1,800 pounds per square inch to the control system and each spindle being equipped with an adjustable relief valve. Through these valves the oil is fed to cylinders, one being located below each spindle. The cylinders and the pistons float, transmitting the load through bell cranks on a fixed mounting to a yoke connected to the center bearings on the spindle. The load then is transmitted to the bearings at each end of the spindle. By this arrangement all bearings receive the same load.

Automobile rear axles and transmissions, together with the bearings used in them, are tested in a 75-100-horsepower General Electric dynamometer together with two G.E. hydraulic dynamometers. As installed in the Timken laboratory a speed range of 200 to 4,000 r.p.m. is available on the propeller shafts.

A bearing-testing machine believed to be the largest in the world, was designed by Timken engineers to meet their special needs. In it single- or double-row bearings up to 24-inch O.D. can be tested to fatigue under both radial and thrust load. Radial loads up to 500,000 pounds and thrust loads up to 200,000 pounds may be applied to the bearings under test by means of hydraulic rams.



Mission Installs Department for Experimental and Test Work

Mission Manufacturing Co., Houston, Tex., has installed what it considers one of the most important additions to its testing and experimental program. It is a complete department for experimental work on and testing of new designs of valves, pistons and other parts for high-pressure slushpumps. The main object is to increase the life of Mission pump parts. Suggested improvements in design and metallurgy are test-run under actual operating conditions in a new, modern high-pressure pump until they break down. Thus every improvement in change and design will be made to prove itself in continuous matched performance against current construction.

The company considers the pump parts experimental department as supplementary to its extensive program of field experimentation. All preliminary experimenting is done in this new department ahead of field testing. The department is equipped with expensive machines and tools, including a high-pressure slushpump, a prime-mover power unit and several extremely accurate measuring and recording instruments. It operates 24 hours a day.

Kobe Branch in Oklahoma City

Kobe, Inc., manufacturer of hydraulic pumps and heat-treated screen casing, has opened a branch at 3119 South Robinson Avenue, Oklahoma City, in charge of C. M. Rader, division manager. Mr. Rader, a graduate civil engineer (University of Minnesota), started his career in Wyoming oil fields and for the past 14 years has held engineering and executive positions. For four years he was with Phillips Petroleum Co. as division engineer and assistant superintendent of production of the Oklahoma division. Kobe, Inc. has appointed Brown-Hovis, Inc., 2214 Campbell Street, Houston, Tex., its representative in that city for screen casing.

Northwest Engineering Offers Truck Crane of New Design

The Northwest Engineering Co., Chicago, announces a new truck crane with features said to mark an advance in this type of machine. Northwest truck cranes are built in sizes of three-eighths, one-half and three-quarter cubic yard capacity. They may be equipped as crane, dragline or shovel. The rotating bedplate is a casting with side frames cast integral. This assures the permanent alignment of shafting.

The power take-off is a helical gear drive mounted on ball and roller bearings and running in oil in an oiltight housing. Ball and roller bearings are used on all high-speed shafting. The cushion clutch, the "feather-touch" clutch control, ventilated uniform-pressure swing clutches, adjustable hook rollers and worm boom hoist which eliminates boom chattering are all standard equipment.

Chemical Industries Exposition

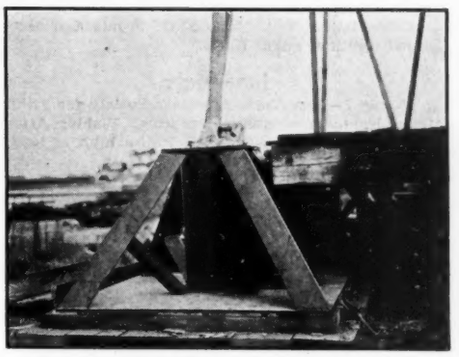
The sixteenth exposition of chemical industries, presenting a pageant of American industrial recovery in the field of chemistry and chemical engineering, will be held in Grand Central Palace, New York, December 6 to 11, 1937. Three floors have been reserved. Dr. M. C. Whitaker, vice president of the American Cyanamid Co., is chairman of the advisory committee. Since the formation and production of all modern commodities rely upon chemical processes at work, the industries founded upon chemistry constitute the groundwork for industrial advance. Principal sections at the exposition will include chemicals and chemical products, metals and alloys, laboratory equipment and supplies, instruments of precision, containers and packaging, material-handling equipment, corrosion resisting coatings, etc.

D. R. Dale Sails for Europe

D. R. Dale, research director for the S. M. Jones Co., manufacturer of sucker-rods, following one of his frequent field trips to Oklahoma oil fields, sailed for Europe. He will study latest metallurgical developments in England, France and Germany. Sucker-rod problems have increased steadily. The growing need for factual data on pumping conditions and metallurgy has expanded so that the company now concentrates its factory engineering and research work in Toledo, Ohio, and a field engineering department has been established in Tulsa to keep in constant touch with pumping problems. Mr. Dale is chairman of the manufacturers subcommittee on sucker-rods and a member of the pumping equipment and materials committee of the American Petroleum Institute.

Rig Construction Simplified by Christopher Steel Corners

Eclipse steel rig corners, put on the market by George C. Christopher & Son Iron Works, Wichita, Kans., are said by the manufacturer to mark a distinct advance in rig construction and drilling contractors' equipment. Built to carry the heaviest drilling and pumping equipment, these corners are electrically welded throughout. They are easily transported to any location and readily set up at small expense. They also make skidding of a complete rig a relatively simple operation, and can be used over and over.



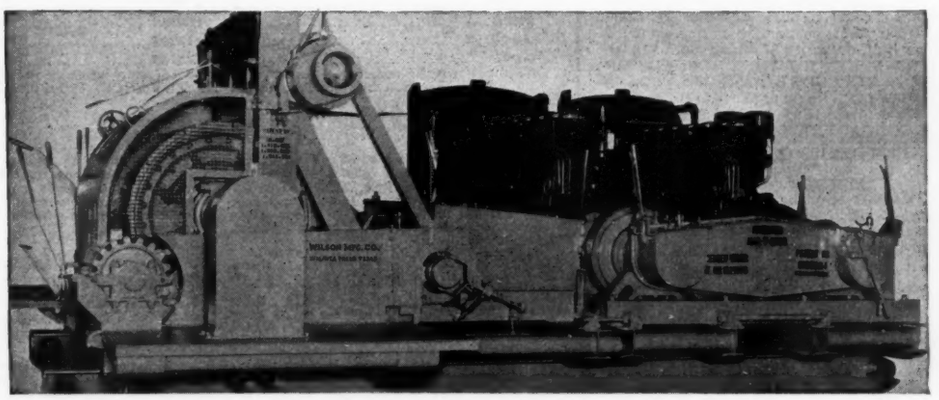
These rig corners, which eliminate the building of concrete corners, are made of heavy steel plate on bottom and top and are supported by a tubular-steel center-post, braced by four heavy corner angles. The frame and sill supports rest on the tubular post, fitted with steel-plate caps. The corners regularly are built in 3-foot heights.

Walworth Today Is New Magazine

Much of interest to oil men appears in the initial number of Walworth Today, new bimonthly house organ of Walworth Co., Inc., 60 East Forty-second Street, New York. G. R. Thompson is editor. Various installations of Walworth valves in the oil industry are shown in pictures. The leading article is on "Creep Testing of Metals," by J. J. Curran, research metallurgist of the company. How the first conversation over a telegraph wire was carried on through use of Alexander Graham Bell's early form of telephone on a private line between two Walworth Manufacturing Co. plants is told.

WILSON ADDS NEW PORTABLE RIG TO ITS LINE

The Wilson Manufacturing Co., Wichita Falls, Tex., has added the Atlas type portable rig to its line. The Atlas is designed to meet the need for a Wilson rig between the Giant and the Titan. It embodies the Wilson chain-drive transmission, improved type master clutch and circulating water-cooled all-steel brake-rings.



The unit is constructed so that it can be broken down into units of less than 8 feet of road width. It has a rated depth capacity of 8,000 feet when using 4½-inch drill pipe and equipped with two 250-horsepower engines. The rig is arranged for Parkersburg hydromatic brake as standard equipment and has a friction and jaw clutch on the final drive. All chains and working parts are completely guarded.

Oil Man's Calendar

June

7—Kansas City, Mo., Oil Field, Gas Well-Refinery Workers of America.

10-12—Pennsylvania Grade Crude Oil Association, annual meeting, on Great Lakes S.S. "Seeandbee," sailing from Buffalo, N. Y.

14-19—Paris, France, Second World Petroleum Congress, during International Exposition.

17—Tulsa, annual meeting, National Stripper Well Association, Mayo Hotel.

20-26—Findlay, Ohio, Findlay's Golden Celebration of Oil and Gas.

25-26—Dallas, Tex., National Oil Scouts Association, annual meeting, Baker Hotel.

June—July

28-July 2—New York, American Society for Testing Materials, fortieth annual meeting, Waldorf-Astoria Hotel, together with fourth A.S.T.M. exhibit of testing apparatus and related equipment.

July

12-13—Santa Fe, N. M., Interstate Oil Compact Commission meeting.

September

(?)—San Francisco, Calif., North American Gasoline Tax Conference.

15-17—Atlantic City, National Petroleum Association, annual meeting, Hotel Traymore.

27—Cleveland, Ohio, American Gas Association, nineteenth annual convention.

September—October

27-Oct. 1—Rochester, National Association of Petroleum Retailers, fifth national convention.

30-Oct. 1.—Tulsa, S.A.E. Fuels and Lubricants Regional Meeting.

October

7-9—Los Angeles, Calif., S.A.E. National Aircraft Production Meeting, Ambassador Hotel.

11-15—Kansas City, Mo.—Twenty-sixth National Safety Congress and Exposition.

11-16—Houston, Tex., Oil-World Exposition.

14-16—Pittsburgh, Pa., mid-year meeting, American Association of Petroleum Geologists, William Penn Hotel.

14-16—Houston, Tex., Independent Petroleum Association of America, annual meeting.

26—New York, Oil Trades Association of New York.

28—New York, S.A.E. Annual Dinner, Commodore Hotel.

29-30—Dallas, Tex., Mid-Continent Oil and Gas Association of Texas, annual meeting.

October—November

27-Nov. 3—New York, National Automobile Show, Grand Central Palace.

November

9-12—Chicago, American Petroleum Institute, eighteenth annual meeting, Stevens Hotel.

December

6-11—New York, Exposition of Chemical Industries, Grand Central Palace.

8-10—Flint, Mich., S.A.E. National Production Meeting.

CLASSIFIED ADVERTISING

Patent Attorneys

JACK A. SCHLEY
PATENT LAWYER

Patents Obtained—Infringement practice in all Courts—oil field experience. 1807-11 Tower Petroleum Bldg., Dallas. 1614 Second Nat'l. Bank Bldg., Houston. 797 Insurance Building, San Antonio. 423 Munsey Building, Washington, D. C. Address any of these offices.

REGISTERED PATENT ATTORNEYS
United States and Canada
Before disclosing your invention to any one, send for blank form:
"Evidence of Conception."
Instructions "How to Establish Your Rights" and complete information FREE!
LANCASTER, ALLWINE & ROMMEL
418 Bowen Building,
Washington, D. C.

Incorporations

CHARTERS — Delaware best, quickest, cheapest, most liberal. Free forms. Colonial Charter Co., Wilmington, Del.

DELAWARE CHARTERS: Complete service $35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Delaware.

For Sale—Maps

Houston Drafting Service
Special Drafting
Maps Posted Up-to-Date
New Locations and Completions
Paleontological Data Posted
P. O. Box 3839 Houston, Texas
Telephone Preston 2111

NEW 1936 OWNERSHIP MAP WOOD COUNTY, TEXAS; a map which we recommend for completeness and accuracy; scale 1"—1000 varas; east and west halves: price either half, on paper $7.50; on cloth $10.00.

RECENTLY REVISED OWNERSHIP MAP UNION COUNTY, ARKANSAS; scale 1"—3000 ft.; price on paper $15.00; on cloth $20.00; on roller $30.00. EBY ENGINEERING COMPANY, TYLER, TEXAS.

SUCCESSFUL OIL OPERATORS
Are Using
ZINGERY OIL MAPS
Our Up-to-Date Lease and Fee Ownership Maps of Counties and Combination Development Maps Save Time and Money.
WRITE FOR DESCRIPTIVE FOLDER
1937 Revised Edition Map of State of Texas, eastern N. M., parts of southern Okla., SW Ark. and La. shows Oil and Gas Fields in color, Counties and County seat and elevations, co-ordinated alphabetical index of fields and counties.
Price $1.00 postpaid
ZINGERY OIL MAP COMPANY
Fair Building Fort Worth, Texas

Any West Texas County Map, 36x42 showing sections, blocks and surveys, $2.00. Oil City Map Co., Ft. Worth, Texas.

OIL MAPS
MAJOR CO. wildcat blocks, pools, etc. New Mexico 1937, colored 50c. BROOKS BROS., 350 Clay, Los Angeles.

For Sale—Maps

SOUTHWESTERN UNITED STATES
Includes all of following states: Texas, Louisiana, Mississippi, Arkansas, Oklahoma, Kansas, also Eastern New Mexico. Shows all oilfields by name and location. Alphabetically arranged list on margin of all discoveries these States during 1936. Lithographed. Size 3 x 4 ft. $1. Same map with pipe lines to date, white print with blue lines $7.50. Send for illustrated catalog describing 400 ownership and field maps in Texas and Louisiana.
ZINGERY MAP COMPANY
Houston, Texas

Financing

CAPITAL SEEKERS—Put your project before 260 Key-Men. Cost trifling. Details free. Amster Leonard, Fox Theater Building, Detroit, Michigan.

CAPITAL raised for development of oil and mining properties and financing of industrial propositions. Individual or corporation, $25,000.00 or more. Write us your requirements. Confidential. Address Box H-803, The Oil and Gas Journal, Tulsa, Okla.

Royalties—Production

NEW MEXICO Oil and Gas Leases and royalties. Send 50 cents in stamps for new State Oil Map of New Mexico. Roy G. Barton, Clovis, New Mexico.

Royalties—Production

PRODUCING OIL ROYALTIES
15 years of experience
L. H. WITWER
214 Kennedy Bldg., Tulsa, Okla.

ANDREW J. BARRETT
The Philtower
Tulsa, Oklahoma.

F. A. SANSOME
Maintains a Complete Trading Organization for Brokers, Banks and Dealers
In
Oil Royalties
522 Fifth Avenue, New York, N. Y.

ROYALTIES PURCHASING TRUST, LTD., Moorgate Hall, Moorgate London, E. C. 2., England, are buyers of producing oil royalties.

HIGH GRADE producing oil and gas royalties offered to dealers. Billie Smallwood, P. O. Box 2261, Tulsa, Oklahoma.

100 ACRES OF PRODUCING ROYALTY in unitized block of 6,500 acres under The Texas Company 500 barrel well in Hockley County, Texas, League 38, Zavala County school land. Price $75 per acre. H. L. Shaffer, 206 Conley Building, Lubbock, Texas.

Royalties—Production

Brokers—Salesmen

Sell in the most active area in the United States—The Permian Basin of West Texas and Southeastern New Mexico. From the standpoint of royalty investors this area has much to offer. Can supply you with choice non-producing royalties located on geophysical highs. Also drilling blocks, close in acreage to production, or wildcat leases. I maintain my own field men who cover this area for me. All offerings meet the requirements of the Securities and Exchange Commission. Inquiries invited.

B. D. BUCKLEY
Paul Brown Bldg., St. Louis, Mo.

ROYALTY RECORD. Complete description of property, history of lease, plat, title record, rental record, mortgage record, expenditure record, sales record, tax record, well records and production record—all on one sheet. Printed on good ledger paper, size 11" by 8½", punched for standard ring binder. Price per 100 sheets, $5.00; leather ring binder, $4.00; imitation leather ring binder, $2.30; leather tabbed index to fit, $1.00. Order this indispensable record to-day.

THE STECK COMPANY
217 W. 9th St., Austin, Texas

PRODUCING OIL ROYALTIES
for dealers
H. P. BOWEN
842 Kennedy Bldg., Tulsa, Okla.

Oil Royalties and Oil and Gas Leases
Bought and Sold
E. T. Marion
1109 Petroleum Building
Midland, Texas

Ranches and Farm Lands

MINNESOTA $40,000. Ranch. 965 acres on lake and river, 40 miles Minneapolis and St. Paul; 100 acres timber pasture, 350 acres cultivated. Got on foreclosed Mgt. $44,000. Improvements worth 16,000. Tiled. Valued at $80,000 when loan was made, now clear. Terms on $14,000. Take undrilled oil lease or interest in prospective lease up to $20,000. 2515 Lyndale Ave. So., Minneapolis, Minn.

RANCHES with mineral rights. 200,000 and 18,000 southwest Texas; 35,000 west Texas, also south Texas, New Mexico ranches. G. D. Miller, Tishomingo, Okla.

FOR SALE AND LEASE Ranches in Texas, Oklahoma and New Mexico. Frank J. Shaller Commission Co., Moody Hotel, Canadian, Texas.

CLASSIFIED DISPLAY RATES

Classified Display is set with a border and may be used in one or two column sizes.

1 Inch	*1 time*	*$5.00*	
1 Inch	*13 times*	*4.50*	*per inch*
1 Inch	*26 times*	*4.00*	*per inch*
1 Inch	*52 times*	*3.50*	*per inch*

This space may be contracted for over a period of one year from the date of the first insertion and is PAYABLE IN ADVANCE, MONTHLY.

CLASSIFIED

Classified advertising rates: First insertion, 35 cents a line; each additional insertion, 25 cents a line, PAYABLE IN ADVANCE. Six words usually make a line. Count as a word each one-letter word and each group of figures. White space computed at regular line rate. Allow two extra lines for blind ads. Ads of less than three lines not accepted. No formal acknowledgement is made, and proofs cannot be shown in advance of publication.

	1 time	2 times	3 times	4 times		1 time	2 times	3 times	4 times
3 Lines	*$1.05*	*$1.80*	*$2.55*	*$3.30*	*7 Lines*	*$2.45*	*$4.20*	*$5.95*	*$7.70*
4 Lines	*1.40*	*2.40*	*3.40*	*4.40*	*8 Lines*	*2.80*	*4.80*	*6.80*	*8.80*
5 Lines	*1.75*	*3.00*	*4.25*	*5.50*	*9 Lines*	*3.15*	*5.40*	*7.65*	*9.90*
6 Lines	*2.10*	*3.60*	*5.10*	*6.60*	*10 Lines*	*3.50*	*6.00*	*8.50*	*11.00*

We reserve the right to withhold all advertising of questionable character. To avoid delay be sure to send remittance with copy. We will set your ad in the smallest amount of space possible and refund all overpayments. One-time insertions will not be run until fully paid. Forms close MONDAY NOON before each issue date.

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

For Sale—Equipment

WELDERS A.C. and D.C. electric motor and engine driven. Reconditioned. Service Co., 3732 Cedar Ave., Cleveland, Ohio.

FOR SALE: 75—10" Standard cast iron gasket type flange unions, new and reconditioned—cheap. I. T. I. O., Bartlesville, Oklahoma.

FOR SALE: 15—3' x 15' National Tank Company sand hogs—cheap. I. T. I. O., Bartlesville, Oklahoma.

FOR SALE: Several used reconditioned Hughes plunger lift units complete for use with 7" casing and 2⅜" OD or 2⅞" OD tubing. I. T. I. O., Bartlesville, Oklahoma.

FOR SALE: 25,000' of new 2⅞" OD 10 thread 5.73-lb external upset Pittsburgh seamless steel tubing reamed for Hughes plunger lift. Located at our Oklahoma City warehouse. I. T. I. O., Bartlesville, Oklahoma.

25 K.W. and 40 K.W. Gas Engines, 220 volts, D.C. Two 100 K.W. Gas Engine-Generator Sets, 220 volts, D.C. 7x6 Ingersoll-Rand ER-1 Air compressor, Six-inch Oster Pipe Threading Machine. Also large stock of lathes, pipe machines, milling machines, etc. Send for our list.
Terms to suit.
CINCINNATI MACHINERY & SUPPLY CO.
28 West 2nd St. Cincinnati, Ohio

FOR SALE: A large stock of McEvoy hand operated blowout preventers. I. T. I. O. Company, Bartlesville, Oklahoma.

USED ROTARY EQUIPMENT FOR SALE

2—125 H.P. 250 lb. W.P. Acme Boilers
1—100 H.P. 250 lb. W.P. Acme Boiler
2—125 H.P. 250 lb. O.W.S. Boilers.
3—100 H.P. 200 lb. W.P. Brodrick Boilers.
1—5 C.3 Unitized Draw Works.
1—6 in. Lucey Unitized Draw Works.
1—20 in. Denver-Gardner Mud Pump.
1—16 in. Johnson Mud Pump.
1—14 in. Johnson Mud Pump.
1—14 in. Ideal Mud Pump
1—27½ in. Lucey R. B. Rotary Table.
2—No. 10 Ideal Rotary Tables.
1—Type B—Regan Crown Block.
1—66 in. Union Tool Traveling Block.
1—72 in. Johnson Tool Traveling Block.
1—12 x 12 Johnson Engine.
2—12 x 12 Ideal Engines.

Also Miscellaneous Drilling, Fishing and Rigging up Tools, Fittings and Boilerfeed Pumps—Located in Oklahoma and Kansas. Communicate with

MidCo Tool & Supply Co.
Box 1542,
OKLAHOMA CITY, OKLA.

FOR SALE — Band wheel power, complete with engine, belt, house, etc. 250 bbl. steel tank. Eastern Kansas. Ernest Platt, 101 W. 11th, Kansas City, Missouri.

Complete Clay Plant, including 6' x 60' rotary dryer, conveying machinery, hammermill, Koering crane with ¾ yard drag line attachment. Currently operating in Oklahoma. For details address Box H-812, The Oil and Gas Journal, Tulsa, Okla.

HAVE COMPLETE photographic studio, both commercial and portrait; also a standard photostat unit and 8 x 10 motorized engraving plant. Would like to contact company who needs this setup as a department. Address Box H-810, The Oil and Gas Journal, Tulsa, Oklahoma.

For Sale—Equipment

Steel Storage Tanks

50—Practically new 80,000-bbl. steel roof tanks, latest type.

125—55,000-bbl. storage tanks at great saving. Prices quoted on request for tanks standing, cut down, or reerected on your grade. Have all other sizes available. All tanks strictly guaranteed.

All kinds refinery equipment, valves, fittings, machinery, pumps and pump repair parts.

Wire—Phone—Write—W. C. Berry

SONKEN-GALAMBA CORPORATION
64 North Second St. Kansas City, Kansas

A COMPLETE 1200 bbl. capacity GASOLINE REFINERY located in Shreveport. Formerly operated as the Griswold Refinery or the Cedar Grove Refinery. Apply J. E. Slattery, 1022 Slattery Building. Office Phone 7564, Shreveport, La.

FOR SALE complete equipment of two wells, consisting of derricks, oil well pumping unit, tanks, two gas engines, casing, rods, tubing, line pipes, fittings and etc. Address Peru Oil & Gas Co., Inc. 510 Insurance Bldg., Oklahoma City, Okla.

FOR SALE: Before moving machine shop to new location, selling our entire stock used pipe, casing, valves, pipe connections, pumps, etc. Elliott Machine & Supply Co., Depew, Okla. See A. D. Elliott.

FOR SALE: Standard Engineering 8" pipe cutter and threader with complete set of dies and taps. Will sacrifice. Highway Trailer Company, Edgerton, Wisconsin.

LUBE PLANT
CENTRAL MID-CONTINENT AREA. Complete equipment for Asphalt or Paraffin Base Crude, with several types available. On R. R. siding. Address communications to Box H-801, The Oil and Gas Journal, Tulsa, Okla.

10 SHARPLES SUPER-CENTRIFUGES, type M4 P5 Q10 complete with 3-HP G. E. Induction motors in extra good condition ready for immediate operation—also spare bowl and 6 spindles. Located at Bradford, Pennsylvania. Address Bradford Oil Refining Company, Bradford, Pa.

FOR SALE: Two Cameron No. 5 six stage centrifugal pumps, one with 500 h.p. GE motor, 30,000 bbl. 24 hours, with 600 h.p. GE motor, 35,000 bbl. 24 hours, synchronous motors with panel boards, good condition. MAX ZEIGLER & BROS., Muncie, Indiana.

FOR SALE: 6 class C-10 Sullivan pump heads with 15' stroke used in Oklahoma City operations. I. T. I. O., Bartlesville, Oklahoma.

FOR SALE
Complete compressor plant in good running condition, located in Nowata Field. 40-HP Clark Gas Engine, direct connected to 11¼x7¼x20 single action tandem compressor, and all connections.
16x32 Braden Steel building.
Price: $2,000.00
D. P. Oak,
611 Mayo Bldg.,
Tulsa, Oklahoma.

FOR SALE: LEVI SMITH REFINERY
Clarendon Pa. Address inquiries
Penn-Reserve Oil Co. L. G. Lockward, Sec.
48 Arlington Ave., Caldwell, N. J.

WRECKING
USED REFINERY MATERIAL FOR SALE
We have purchased the refinery of the Atlantic Refining Company at Pittsburgh, Pa., and will dismantle the same. We have for sale large quantities of pipe, valves, condensers and tanks of all sizes and description, cracking stills, belt conveyors, water towers and refinery equipment.
ROSEN WRECKING COMPANY
Atlantic Refining Plant
Butler Street
Pittsburgh, Pa.

Equipment Wanted

WANT TO BUY two old style, 35 H. P. Superior, two cycle Gas Engines. Quote condition, price and location. SANDERS & MURCHISON, Athens, Texas.

WANTED: 1 Pipe Line Pump—capacity 80/100-bbls. per hour against 500-lbs. pressure, preferably motor driven. Also, 1 Air Compressor, 200 cu. ft. per minute, 100-lbs. pressure. Address Bradford Oil Refining Company, Bradford, Pa.

OIL FIELD Boilers—3 of at least 75 H.P. rating and allowable working pressure of not less than 175 lbs. Must be worth the money. Give location. Address Box H-815, The Oil and Gas Journal, Tulsa, Oklahoma.

Situations Wanted

REFINERY CHEMIST. 5 years' experience. Qualified as Chief Chemist and also in control and research work. Graduate Chemical Engineer. Available for immediate connection. Excellent references. Address Box H-814, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE CHEMIST — Fifteen years' experience in oil refineries and commercial laboratory. Available at once. Address Box H-811, The Oil and Gas Journal, Tulsa, Okla.

EXECUTIVE

Oil executive with exceptional 16 years' record established in the principal branches of the industry seeks new connection with progressive major or independent company. Thoroughly experienced in production, transportation, crude purchasing and marketing, land work, acquisition of properties and companies, public relations, industrial relations, special group contacts and political expediency.

Has served as chairman of state code and gasoline tax evasion committees, secretary of prominent oil trade association and assistant to the director of a national program cooperatively sponsored by the oil industry.

Recent and current activities embrace the successful handling of company and industry tax matters, legislative contacts with state and federal administrations, state assemblies and Congress. Accordingly, will be especially valuable to company determined to keep abreast of changing conditions.

Health, personality, and capabilities of the best. Can furnish impeccable financial and personal record and unlimited references from leading company executives. This advertisement published with full approval of present employers. Address

BOX H-781
The Oil and Gas Journal
Tulsa, Oklahoma

GENERAL SUPERINTENDENT of skimming and cracking plants available in near future. Thoroughly experienced and can give good references. Address Box H-802, The Oil and Gas Journal, Tulsa, Okla.

Help Wanted

REPRESENTATIVES wanted, principal towns Mid-Continent field, for live Coast oil weekly newspaper. Combination reportorial, subscription, advertising work. Exclusive franchises, excellent remuneration. Write National Oil Derrick, 900 Spring Arcade Building, Los Angeles, Calif.

OPERATORS AND HELPERS WANTED for new refinery in Texas. Must have had experience with Dubbs Cracking and Reforming Vacuum and Atmospheric distillation. Give particulars in first letter. Address Box H-790, The Oil and Gas Journal, Tulsa, Okla.

CHEMIST—Petroleum Refinery is interested in receiving applications from college graduates having a degree in Chemistry or Chemical Engineering. In answering, please give full particulars as to age, past experience, school attended, degree received and year graduated. Also enclose small photograph if available. Address Box H-813, The Oil and Gas Journal, Tulsa, Okla.

Oil Industry Printing

OIL FIELD LEGAL BLANKS
Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

Leases—Production

NEW MEXICO—My weekly scout report furnishes complete and reliable information on New Mexico developments. Send for copy. W. S. Patterson, Santa Fe, New Mexico.

New Mexico OIL LEASES WHOLESALE
40 acres at a time.
Roy G. Barton, Clovis, New Mexico.

LEASES near Paluxy-Trinity sand Oklahoma Ordovician tests now drilling where there is chance for 50 to 1 return few weeks. E. CROFT, Proctor, Texas.

Specializing leases twenty acres up dollar acre, East Tex., La., S. Ark. Owners—Attorney. Box 1122, Little Rock, Ark.

LANDS Leases, Royalties, anywhere, bought, sold. Lands, $2 acre up. Leases 25c acre, up. Advise needs. American Investment Co., Houston, Texas.

980 ACRES YOAKUM CO., TEXAS
OIL AND GAS LEASE for immediate sale, consisting of Sec. 596 and W½ Sec. 597 in active developmental sector. Submit maximum offer to owner. Dr. J. A. Robinson, National Military Home, Los Angeles, Cal.

LEASES and ROYALTIES
Kearny County, Kansas
BEYMER & BEYMER, Lakin, Kansas

WILL BUY prospective oil lease, or not less than ¼ interest in not less than 40 acres in Kansas. Will furnish capital to develop. Write 2515 Lyndale Ave., South Minneapolis, Minn.

SOUTH TEXAS oil and gas leases. New 88 form with low rentals. Dealers or brokers only. H. H. WHITE, P. O. Box 674, San Antonio, Texas.

WELL WANTED—On 1,000 acre block in Permain Basin, Texas, South-East of Howard-Glasscock pool. Howard-Glasscock has produced 60,000,000 bbls. past six years. Major company recently paid bonus for extention of lease near this block. Will give 6/8 of oil and gas under block for well to go 2,700 feet. Good possibility commercial production at less than 2,000. Address Box 1082, Austin, Texas.

AM ready to figure with you on your bargains in Lands in fee or any type of Oil properties to buy or sell. My thirty years in this business here enables me to know values large or small. E. B. REEVES, Box 475, McLean, Gray County, Texas.

WANTED: Stripper oil production or wells or leases that are ready for salvage. Address Box H-724, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL and Gas Leases and Royalties, some producing and some near drilling wells. In the Permian Basin of West Texas and Lea County, New Mexico.
C. E. POYNOR
Naylor Hotel Building, San Angelo, Texas.

ARKANSAS
Does not have any production (proration) restrictions. The opportunity for quick "payouts" is obvious. Come here and investigate royalty and lease opportunities.
WILLIAM MONROE LAYTON
P. O. Box 411 Texarkana, Ark.

RUSK FIELD, offer leases and non-producing royalties, attractive prices. Test drilling two miles east by north. Watch the trend, let me have your orders. They won't keep. E. W. COLE, RUSK, TEXAS.

OIL GEOLOGY—CHANCE ELIMINATED
Co-operation with responsible operators to demonstrate our system, which eliminates dry holes in oil industry, and invite investigation. Strataphysic System, Box 375, Durant, Oklahoma.

HAVE TWO 5,000 acre blocks adjacent new Powder Wash field along Colo.-Wyo. state line. Big lease play. Structures mapped U.S.G.S. and major geologists. Six sands under 5,000 feet. Would like to contact responsible drilling contractor with rotary equipment who would take interest, also brokers to handle leases or finance. S. Marvin James & Co., University Building, Denver, Colorado.

I OWN 480 acres in fee next to Sisne well in Wayne County, Illinois. Will make more liberal lease than any other owner. S. M. Homan, 7205 Exchange Ave., Chicago.

Business Opportunities

WANTED: Loan of $25,000.00 for expansion Natural Gasoline plant East Texas oil field; going concern and making profit; excellent market for all gasoline can make. Address F. J. Morris, Box 187, Tyler, Texas.

Mailing Lists

ROYALTY INVESTORS from pipe line records. Lease investors. Oil Industry Mailing List Co., 909 Tulsa Loan Building, Tulsa, Oklahoma.

ROYALTY OWNERS
Names and addresses in any State.
Royalty Lists, Box 105, Ft. Worth.

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